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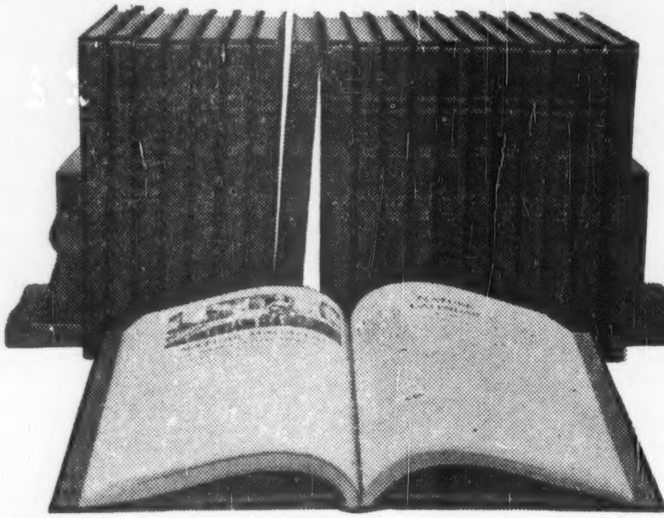

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Reviews

Of Things Bi-illogical

By Bernal R. Weimer. Distributed by the Author, Bethany College, Bethany, West Virginia. 70 pages. Illustrated. $2.00.

This is a unique anthology, in the author's words "a volumette replete with bi-illogical song, 'corn,' and caricature." Dr. Weimer, who is Dean of Faculty at Bethany College, also expresses the hope that the reader will "relax a minimal millimicron, and sink to my bethonic level . . . " From far and wide the author has collected humorous verse, prose, short items, such as "A biennial is a plant that lives and dies twice a year." (This, no doubt, a gem from a student's paper in a botany exam.) Dr. Weimer has made contributions of his own and one of the sources he has drawn upon is our own Julian D. Corrington, whose parodies often enliven his microscope department. This is a most entertaining little book and an ideal gift to a biologically minded friend, especially one who may take himself a shade too seriously.

Trees and Their World

By Carroll Lane Fenton and Dorothy Constance Pallas. New York. 1957. John Day Company. 96 pages. Illustrated by Carroll Lane Fenton. $3.25.

This is an introduction to trees, individually and collectively, and their important place in our economy and happiness of existence. The authors have written for an age level of between eleven and fourteen. The text is as lively as it is informative and ranks among the best introductory texts on trees and forests.

Hold that Tiger

By Sam Dunton. New York. 1957. Greenberg. 188 pages. Illustrated. $3.95.

Sam Dunton is Staff Photographer of the New York Zoological Society, which mantains the Bronx Zoo. In the course of his work he has, of course, photographed many inmates of the zoo and had interesting experiences in the process. However, he has also gone on expeditions to far places where high adventure attended his photographic activities. The author writes with great appreciation of the animals who have been his subjects, and tells his story well.

Observations on Birds of Southeastern Brazil

By Margaret Mitchell. Toronto, Canada. 1957. University of Toronto Press. 258 pages. Colored frontispiece of Accipiter pectoralis, and black and white plates. $5.50.

Living in Rio de Janeiro from 1950 to 1954, the author was able to enjoy her life-long avocation of field ornithology in an area rich in opportunity for such activity. She found few books on birds of Brazil and these in Portuguese, so her bird study was at first baffling, frustrating and pioneering. However, with the aid of Dr. Oliverio M. de O. Pinto, then Director of the Zoological Section of the Sao Paulo State Museum and a noted Brazilian ornithologist, Mrs. Mitchell was able to solve language and scientific problems. During her Brazilian stay she was able to identify and study 289 species out of the some 2000 species and subspecies in that vast South American nation. These provide the basis for this excellent book, which is of special interest to ornithologists and to all bird-minded visitors to Brazil.

Smoke over Sikanaska

By J. S. Gowland. New York. 1957. Ives Washburn, Inc. 224 pages. $3.50.

As a boy the author of this engrossing story of life as a forest ranger, dreamed of being an airplane pilot, cowboy, forest ranger, gold prospector or soldier. He has been all of these, following a restless life after service in World War I. Just before World War II broke, he found himself in England and, soon, in the R.A.F. To relieve the tedium that often goes with service, he told stories of his ranger experiences in Canada's wilderness and thus laid the basis for this book, which, he says, is written only to entertain the reader. It certainly does.

A Treatise on Limnology

By G. Evelyn Hutchinson. New York. 1957. John Wiley & Sons. 1015 pages. Illustrated. $19.50.

This is the first of a two-volume series that are aimed to give as complete account as possible of the events that characteristically occur in lakes; the geological, biological, physical, chemical and other processes that all operate together in a lake basin. Volume one concerns itself with the geography, physics and chemistry of limnology.

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Nature Magazine, past and present, is indexed in The Reader's Guide in your public library.

Birds of Eastern and Northeastern Africa

By C. W. Mackworth-Praed and Captain C. H. B. Grant. New York. 1957. Longmans, Green and Co. Illustrated in color and black and white, with distribution maps. $2.50.

When the two authors of this book first went to live in Africa they much wanted a book like this. None existed, so the authors set about to gather the material for this volume, which first appeared in 1952. Now revised and corrected, it appears in a second edition. Recent additions to the list of birds, now known to occur in the area covered, have been made. This is a reference book and a field guide, although hardly a pocket volume. It covers the bird life of the Anglo-Egyptian Sudan, Abyssinia and Eritrea, the Somalilands, Kenya Colony, Uganda, Tanganyika Territory, Zanzibar Islands, the eastern part of Nyasaland and Portuguese East Africa north of the Zambesi River.

Exploring the Animal Kingdom

By Millicent E. Selsam. New York. 1957. Doubleday and Company. 64 pages. Illustrated by Lee J. Ames. $2.50.

Aimed at an audience of young people from eight to fourteen, this book is an introduction to the animal kingdom. It establishes in the mind of the young reader a basic picture of animal relationships, from the protozoa to the mammals. Having taught biology and having written a dozen books for children, the author knows what to tell her audience and how to reach them. The illustrations and the text blend into a most effective story.

The Exploration of the Colorado River

By John Wesley Powell. Chicago. 1957. University of Chicago Press. 138 pages. Abridged from the first edition of 1875, with an introduction by Wallace Stegner. $3.75.

The story of Powell's acceptance of the challenge of the Colorado River is a classic in exploration and courage. In the course of this perilous trip the explorer kept a journal, which supplied the text for the first publication of this adventure. The original has long been out of print and this edition now makes Powell's story available. Wallace Stegner's introduction adds evaluation of this pioneer accomplishment.

The Stars

By W. Kruse and W. Dieckvoss. Ann Arbor, Michigan. 1957. University of Michigan Press. 202 pages. Illustrated. $5.00.

In this book the authors deal with both the stars we can see in the night heavens and with many others beyond the reach of the human eye. They are concerned with that part of the solar system that lies beyond the immediate heavenly family with which earthlings are most intimately acquainted—the moon, the sun, and the planets and comets that move about the sun. Here, then, is the story of celestial bodies thousands of billions of miles away, what we know of them and how we come to know it.

Forest Nursery Practice in the Lake States

By J. H. Stoeckeler and G. W. Jones. Washington, D. C. 1957. Superintendent of Documents. 124 pages. Illustrated. $2.00.

Maintenance of the forest production ability and potential in the Lakes States is an important economic activity. Therefore the success of nurseries that supply the forests-to-be must be assured. This book is a source of valuable information for anyone concerned with the nursery raising of trees in this part of the country.

The Ants

By Wilhelm Goetsch. Ann Arbor, Michigan. 1957. University of Michigan Press. 170 pages. Illustrated. $4.50.

It is obvious from this little book that the author is an "antophile," if such a word is permissible. He not only admires ants but seems to love them, and here has written a popular account for the lay reader that reflects his enthusiasm. Dr. Goetsch says that his book is no more than a sampling of ant lore. However, it is a most interesting and satisfying sample.

Bill and the Clown Bird

By Betty B. Herndon. Caldwell, Idaho. 1957. Caxton Printers. 153 pages. $3.50.

Bill had many wild pets that he loved very much, and the most interesting and unpredictable was a road-runner. This is an interesting story for the younger reader who loves Nature and her many fascinations.

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Nature IN PRINT

By HOWARD ZAHNISER

Two Nature Anthologies

TWO RECENTLY PUBLISHED ANTHOLOGIES have recalled anew the enjoyments there are in a collection of writings on a subject of one's interests brought together by someone who himself is interesting, and is able and willing to tell why he has made his selections and why they seem to him to be important. John Kieran, in a compact volume of some 640 pages, has brought together five dozen selections that touch on "many aspects of Nature and varied departments of Natural History," has written comments on each with biographical notes on their authors, and has thus produced what his publishers have entitled *John Kieran's Treasury of Great Nature Writing*. Roger Tory Peterson, in a handsome large-size volume—large enough to provide a page that seems adequate to an artist for the presentation of his drawings—has selected and illustrated and illuminated with brief introductory notes eighty-five "pieces that reflected the bright light of direct observation" and comprise what he calls *The Bird Watcher's Anthology*. Both volumes are not only interesting in themselves but also as expressions of their highly interesting compilers, and thus they become notable anthologies.

John Kieran first became known to many of us as a sports writer for *The New York Times*, one who could be read with appreciation for what he contributed out of his own lore and eloquence as well as for what he was reporting in the world of sports. Then he amazed and delighted many thousands of listeners with a radio program called *Information Please*, because in this program, which was a "game" between a board of experts who tried to answer questions and listeners throughout the land who tried to ask questions that could not be answered, John Kieran had a mind remarkably well furnished with quotations from the poets and much knowledge of many kinds. His brilliant and good-humored responses to questioners were perhaps most delightful when they came from his knowledge of poetry and of birds or other aspects of Nature, and he soon had an "audience" not only of listeners but also of readers. He has another collection called *Poems I Remember* and a half-dozen Nature books. Two of these are his *Footnotes on Nature* and *John Kieran's Nature Notes*. He also has written *An Introduction to Birds*, *An Introduction to Wild Flowers*, *An Introduction to Trees*, and has combined these three separate volumes in another called *An Introduction to Nature*. He is an ideal anthologist. Going through his anthology is like visiting his library and enjoying his comments on his own favorites.

From his library

"Most of the selections," in fact writes John Kieran, "are from books in my own library." He tells us also that the book was "designed to be entertaining but not authoritative; informative but not instructive." He put the collection together, he says, "with the idea of demonstrating the breadth and width and depth of the subject, the many facets for examination, the many beauties for appreciation, and the ever-accumulating fund of fascinating facts for pure intellectual enjoyment." So far as I am concerned he has indeed succeeded.

One of the most charming delights in the enjoyment of John Kieran's "conversations" in this anthology, if we might properly so call them, is in his "recitations" of his favorite poems, or quotations from poetry. Wherever the conclusion of a selection of "nature writing" left a blank space on the page, there John Kieran has inserted one of his familiar bits of poetry. In a postscript to his foreword he engagingly explains that he managed to get these in "over the dead bodies of several publishing executives who threw themselves out of various windows when I insisted." One hopes that the publishers have been resurrected. In any case it is a delight thus, as it were, to "hear" John Kieran burst into quotation on the mere excuse of a bit of blank space and thus to "hear" again William Wordsworth's "*Daffodils*," John Keats' *Ode to a Nightingale*, Oliver Wendell Holmes' *The Chambered Nautilus*, Robert Burns' *To A Mouse*, and a couple of dozen others. In fact, it seems that John Kieran has, on need, even forced a following selection to begin a page farther along in order for him to finish one of his longer favorites. Many will be delightfully thankful.

John Kieran's autobiographical notes also are helpful and likewise interesting, and his introductory comments charming and interpretive, the remarks of a well-informed reader who has not only known but also has regarded his authors and their writings well. Thus of John Burroughs he comments: "The important fact in the long and happy life of John Burroughs was that, in his last writings, he bridged the gap that ordinarily separates the naturalist from the Nature-lover. He was not a scientist; he was an artist, a writer who painted what he saw in clear words and poetic phrases. . ." In his introduction to his selection of "The Burrowing Owl" by Elliott Coues, John Kieran writes, "The author of this article on that odd bird, the burrowing owl, was something of an odd bird himself," etc. One of the pleasures of the anthology is to come upon George Borrow's *Lavengro*, here represented by his account of "The King of the Vipers," and to read John Kieran's comment on Borrow. One, however, can only select here and there when he himself is commenting on an anthology, and must leave to any reader the prime pleasure of discovering what is presented.

More formal choices

The Bird Watcher's Anthology that Roger Tory Peterson has compiled has perhaps more of formality than John Kieran's literary selections from the broader fields of outdoor literature. Roger Peterson's comments on his individual selections are more often briefer introductory notes. He does often relate himself to his writer or to the selected writing, but Roger Peterson's contribution of a personal nature, in addition to his informed selection, is in his arrangement of the volume and in his superbly exquisite illustration of it. There are within this volume not

only a beautiful frontispiece in color of Atlantic puffins and fifteen other full-page black and white drawings, but, also, a charming and illustrational small drawing at the head of each selection, and all by our anthologist. A list of "Bird Drawings by Roger Tory Peterson" that follows the volume's Table of Contents includes ninety-five. These drawings and the creative arrangement of the book's selections make *The Bird Watcher's Anthology* a notable book in and of itself and as one among the works of Dr. Peterson.

For the perfection of this anthology is in seven parts, so designed and so arranged as to give a reader not only pleasure and information in the perusal of its individual selections from the articulate and experienced bird writers in literature, but also to convey an understanding of the total experience represented in that remarkable human activity called bird watching. Thus it is that the selections in this anthology are arranged in seven groupings, each with a comment by Roger Peterson on the common subject represented in the grouping, a comment that is itself a brief essay. "The Spark," or the occasion for the first interest in birds by the various writers, is the subject of the first of these groupings; the others deal with "The Lure of the List," "Migration," "Glamour Birds," "Birds in Far Places," "There Is Often Adventure," and finally "The Full-Fledged Watcher." As Dr. Peterson himself explains, these seven sections "trace the classic progress of the bird watcher from the first spark of his interest through the discovery and listing stages to the thoughtful observations of the mature student." Thus the reader, whose interest in birds will carry him along from one to another of these outstandingly excellent selections of writings with their "short introductory paragraphs," which in the words of the foreword, "are not so much biographical sketches as they are program notes," can find himself at the end of this volume guided by Roger Tory Peterson into an excellent understanding enhanced by the book's expressions of Dr. Peterson's skill in illustration through drawing. Like all good anthologies, like *John Kieran's Treasury of Great Nature Writing*, for example, *The Bird Watcher's Anthology* is a volume to skip through to note its selections and the character of its choosings, then to be read through, and finally to stay on the shelves for occasional browsings and savorings—a work not to be substituted for any of the writings from which it draws its selections but rather along with them to be enjoyed for itself. Such I take it to be the difference between a truly successful anthology and a mere selection of writings, not to spare the "time" of the reader but rather to enrich his enjoyments and understanding.

The Bird Watcher's Anthology. Roger Tory Peterson. New York: Harcourt, Brace and Company. 1957. xv + 401 pp. (6 3/4 by 10 1/4 in.) with foreword, seven introductions to groupings of the selections, introductory paragraphs to the volume's 85 selections, and 95 bird drawings by Peterson including frontispiece in color, 15-full-page black and white illustrations, and drawings at the head of each selection. $7.50.

John Kieran's Treasury of Great Nature Writing. Edited with comments and biographical notes by John Kieran. Garden City, N. Y.: Hanover House. 1957. 640 pp. (5 5/8 by 8 1/2 in.) $4.95. ❦ ❦ ❦

Animal Legends

By Maurice Burton. New York. 1957. Coward-McCann. 318 pages. Illustrated by George T. Hartmann. $4.95.

Many legends have grown up around animals, from sea serpents to animal funerals. In the light of modern knowledge of animal behavior many of these have proved to be false, even though they persist in the folklore. Others have been substantiated. In this book the eminent British zoologist assembles in interesting fashion the fact and fancy and draws upon his own wide experience and observation.

Fishes of New Mexico

By William J. Koster. Albuquerque, N. M. 1957. University of New Mexico Press. Illustrated. $1.00.

This guide to the fishes to be found in the waters of New Mexico presents, in non-technical terms, eighty different species of fishes. Line drawings accompanying the descriptions indicate the different shapes of the fishes and aid identification. For the most part, fishes found in New Mexico are common to Texas, Oklahoma, Colorado, Utah and Arizona, so this handy guide has wider geographical application than the title might indicate.

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OUR JANUARY AUTHORS

Virginia S. Eifert

George S. Fichter

Ruth Kirk, author of the recently published book "Exploring Death Valley," is the writer-wife of a National Park ranger. The Kirks make their home—for the present, at least—in Ashford, Washington . . . George S. Fichter, former editor of "The Fisherman," and writer on conservation and wildlife subjects, launched into a writing career many years ago when the editor of Nature Magazine rejected one of his poems; he has spent the intervening years proving that editors can sometimes be mistaken . . . Beulah Woods Allen, student of bird life and article writer, lives in Ponca City, Oklahoma . . . Virginia S. Eifert, author of a number of books and long-time contributor to Nature Magazine, also is editor of the Illinois State Museum's "Living Museum" she was recently a guest instructor at "The Clearing," about which she writes in this issue . . . Maxwell C. Wheat, Jr., is president of the Brooklyn, New York, Bird Club . . . H. H. Pittman is a Canadian naturalist, photographer and wildlife writer who lives at Wauchope, in the Province of Saskatchewan . . . Margaret Whittemore is a free-lance writer of Sarasota, Florida, with a particular interest in Nature and conservation subjects . . . R. R. Thomasson is the assistant director of the agricultural extension service of the University of Missouri.

This Way to the Stars

By John Schealer. New York. 1957. E. P. Dutton and Co. 181 pages. Illustrated. $2.95.

As soon as early man discovered the heavens he became interested in them. As he developed a spoken language, explanation of the universe began to have a place in the myths he told about the sky and the mysteries of space. In this introduction to the stars the author traces the growth of knowledge of astronomy as a means to learning of the heavenly bodies and their behavior.

Poison on the Land

By J. Wentworth Day. New York. 1957. Philosophical Library. 246 pages. $6.00.

Although this book deals with the British scene, it has close application to the situation in America. The author is concerned with the effects on wildlife of toxic sprays, pollution of streams, powerful fertilizers and other factors with an important bearing on ecology. The first part of the book is devoted to the problems and the second deals with suggestions for their solution.

Strange Wonders of the Sea

Translated and Adapted from J. Forest's Beautés du fond des mers *by H. Gwynne Vevers. Garden City, New York. 1957. Hanover House. 102 pages. Illustrated in color and black and white. $4.95.*

This is a dominantly picture book of undersea life, covering a variety of sea forms and including corals and shells. The color reproduction is excellent and the black and white subjects are fine. It is not an identification text but a delight to see.

The Real Book About Prehistoric Life

By Dorothy Shuttlesworth. Garden City, New York. 1957. Doubleday and Company. 216 pages. Illustrated by Matthew Kalmenoff. $1.95.

The author of this book was for several years on the staff of *Natural History Magazine*, and is an editor of *Junior Natural History*, positions that would seem to qualify her well for the task of interpreting to youngsters the prehistoric life of the earth, from the first simple forms to the relatively recent past. While no attempt is made to avoid scientific names and terms, when these seem necessary, the story should be a fascinating one for inquisitive boys and girls, as well as the adult who has only a casual acquaintance with the subject of prehistoric life.

Exotic Plants of the World

Translated and adapted by Anthony J. Huxley. Garden City, New York. 1957. Hanover House. Illustrated in color and black and white. $4.95.

The text in this attractive book has been adapted from Marcel Belvianes' *Beautés de la Flore exotique* and is primarily a picture book. In fine color and in effective black and white, notable exotics from various parts of the world are presented with brief text, or merely identified by scientific name.

Cosmic View

By Kees Boeke. Introduction by Arthur H. Compton. New York. 1957. John Day Company. 48 pages. $3.25.

The subtitle of this book is "The Universe in 40 Jumps." These forty jumps consist of forty illustrations with full captions. It is difficult briefly to describe this little book, however. Perhaps it could best be described as a skillful and ingenious presentation of ourselves in perspective relationship to spheres of existence and to the universe.

Briefly Noted

ABC of Driftwood for Flower Arrangers. By Florence M. Schaffer. New York. 1957. Hearthside Press. 128 pages. $3.95. Profusely illustrated discussion of the decorative possibilities in using driftwood in conjunction with flowers.

Eels. By Leon Bertin. New York. 1957. Philosophical Library. 192 pages. $7.50. A biological study of the life of one of the most fascinating of creatures.

Bermuda Fishing. By Joe Brooks. Harrisburg, Pa. 1957. The Stackpole Company. 166 pages. Illustrated. $4.50. Experience and advice about fishing in the waters of Bermuda.

America the Beautiful. By Betty Lou Potts. New York. 1957. Greenwich Book Publishers. 90 pages. $3.00. A rather superficial guide to travel and points of interest.

Fifty Years with Harness Horses. By Clair Wolverton. Harrisburg, Pa. 1957. The Stackpole Company. 179 pages. Illustrated. $4.50. A book of special interest to the army of devotees of sulky racing.

The Scientific Study of Social Behaviour. By Michael Argyle. New York. 1957. Philosophical Library. $6.00. A book for students of psychology and others interested in the laws underlying social behavior.

The Science of Skin and Scuba Diving. New York. 1957. Association Press. 306 pages. $3.95. A collaboration of specialists cooperating in a project of the Conference for National Cooperation in Aquatics. A practical book for the many followers of this sport.

Reason and Chance in Scientific Discovery. By R. Taton. New York. 1957. Philosophical Library. 171 pages. $10.00. The author examines the relative roles of active purpose and chance in the processes of scientific discovery.

Practical Astronomy. By W. Schroeder. New York. 1957. Philosophical Library. 206 pages. $6.00. The author deals only with those aspects of astronomy that lend themselves to practical work.

Contents noted BY THE EDITOR

THAT KEEP AMERICA BEAUTIFUL, INC., is doing a tremendous amount toward changing the American habit of tossing litter about was evidenced at the recent annual meeting of the Advisory Council of that organization. Reports from workers in the field revealed an amazing amount of ingenuity in applying educational techniques. Such devices as Philadelphia's development of block committees of youngsters, in cooperation with the police department, were truly exciting. Exhibits showed the inventiveness of America in the wide variety of forms taken by litter bags, and the provision of these handy receptacles by many industries and organizations. The Jaycees showed their gargantuan trash basket, made specially for them by U. S. Steel and dramatizing the litter problem. The KAB meeting, being held in New York, afforded tangible evidence of what a great city can do in combatting the problem of litter, for Gotham is cleaner than it has ever been. While the largest percentage of the reports made dealt with solving the municipal problem, it is to be hoped that extermination of the litterbug instinct in communities will result in comparable good outdoor manners in the open spaces. We were disturbed by only one development and that was some trend to accept free billboard space to carry the anti-litter message. Outdoor advertising being the worst litterer of the rural countryside, such an "educational" activity seems most inappropriate. Indeed, a substantial number of the organizations represented on KAB's Advisory Council are actively campaigning for strict control of outdoor advertising along the 41,000 miles of the new Inter-State and Defense Highway system to be built. Keep America Beautiful has not itself used billboards, but some cooperating groups unwisely have done so.

OCCUPATIONAL HAZARDS OF THE AUTHOR took on a new aspect through the testimony in a letter recently received. The author wrote that she had her article and illustrations ready to send, but added: "It will probably not be mailed until about the nineteenth. The deer-hunting season is almost upon us, when it is worth your life to peek out of the door. As my husband walks three miles for our mail along a winding wooded road, he will probably go at night, leaving any outgoing mail in the rural box. It wouldn't be sense to leave a manuscript and drawings, as we are sometimes afflicted with these dolts who think shooting a mailbox is dandy fun."

"HUNTERS WING 66 MICHIGANDERS" says a headline over an Associated Press item out of Detroit. The story records the fact that Michigan's open season on small game opened on a Monday. By Tuesday sixty-six persons had been wounded. In addition, four hunters had died of heart attacks in the field, and another had been killed in a traffic collision in which two hunters were involved.

NATIONAL PARK SERVICE'S MISSION 66 was aimed at equipping the national parks and their administrative personnel to handle an estimated eighty million visitors by 1966. Judging by the statistics for 1957, however, there are indications that the eighty-million-mark may be reached earlier than was anticipated. Some 51,000,000 visitors to areas under the Service's jurisdiction were recorded during the nine-month period ending September 30, 1957. This was an increase of about nine percent above the figure for the comparable period of 1956 and indicates sixty million visitors during 1957. Yellowstone, the oldest park, had a ten percent increase; Everglades saw a twenty-six percent rise in number of visitors; Zion National Park had a twenty percent jump in visitation. Obviously it is going to be a difficult task to reconcile the growing number of visitors with the need to maintain the wilderness character for which the major National Parks were set aside.

WILDLIFE CONSERVATION AND POLITICS do not mix any better than oil and water so far as modern concepts of wildlife management are concerned. The people of Oklahoma recognized this when they voted for a constitutional amendment to divorce their newly created Department of Wildlife Conservation from political control. However, when the director of the new State agency set to work to eliminate the political deadwood from the game ranger staff and to streamline operations in the interests of economy and sound management, some State legislators immediately whetted their knives for Director Clarence Burch. Oklahoma's Governor, Raymond Gary, however, is solidly behind his departmental chief, as are conservationists in the "Sooner State." Nevertheless, legislators hate to see patronage get away from them and, along with it, control over the purse strings of the wildlife department. Loss of the Oklahoma battle to selfish interests should be a step backward and we cannot afford any such marching in reverse with the pressures that confront our wildlife populations today.

R.W.W.

Sniffles often waited for the school bus with the children; once even climbed aboard.

Ranger Station Wildlife

One of the accepted facts of life at a ranger station is that living close to Nature usually means very close. Ranger stations not only have virgin scenery right at their doors—forest, plains, or desert—they each come complete with their own set of household wildlife. Exactly what you have depends on what park you are in. In our case, my husband Louie and I have gone from porcupines, elk and buffalo to scorpions and lizards, and to deer, skunks and mice.

Our first station was Wind Cave National Park, in South Dakota. Porcupines kept us awake at night there, rhapsodizing over the wild plums just outside our bedroom window. Bull elk bugled their love cries from the hill across the valley—always at dawn! The buffalo did not rob us of our sleep, but they were equally disruptive in another way. I have had to call the boys in from play when the animals decided our lawn offered the best grazing in the whole of a thirty-thousand-acre park. And, coming home late from choir practice one snowy February night, I was trapped in the garage for half an hour while the whole herd, as it seemed, stood at our back door. I do not know what they wanted there, or why they finally left, but I am still sure it was a wise decision not to try to push my way through them. A bus tried *that* with some stragglers that were crossing the road, and it ended up with its front end smashed in when a one-ton bull objected.

Maybe I would have grown to trust the buffalo, in time; but we were at Wind Cave only a year. That is the way it goes in the National Park Service. You settle in one place long enough to buy fur-lined jackets and snowshoes for the whole family, and you are transferred to the desert! From Wind Cave we went to Death Valley. But let me add that I would not miss such abrupt changes, even if I could. Besides, you can count on being sent back to the snow once you have acquired an air conditioner for your car!

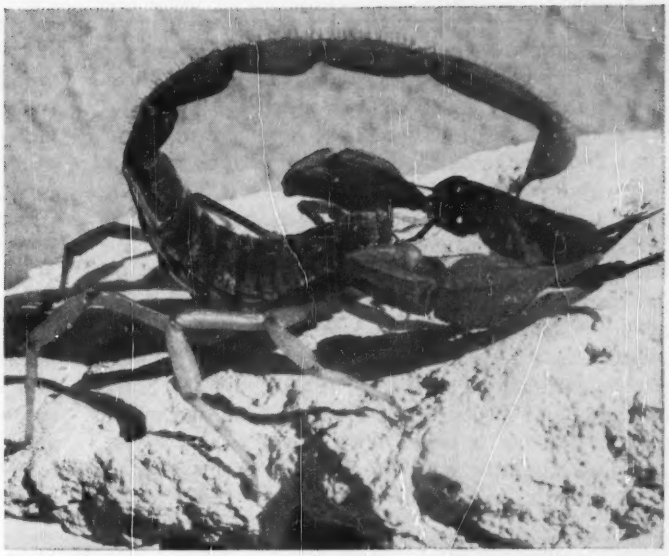
In Death Valley, we had no large animals; at least, not as part of our household. There are wild burros and bighorn sheep in the Monument, but most of the forty mammals on the Park Service checklist are rabbit-sized and smaller. We went in particularly for "critters" instead of mammals—a scorpion, a lizard and a horned toad; the latter being, of course, a lizard, and not a toad at all.

The scorpion was the first to join us, a three-incher that the boys named "Tweezers," because of his pincers. Like our other small animals, he was collected to be photographed. The strategy was to put him on a rock on top of a milk bottle, a pedestal so high and slick that he could not get away. He would make a quick investigation of the situation, and then be ready for us to give him an insect and photograph the results.

We always used live crickets, moths, and also spiders. Tweezers would grab whatever tidbit it happened to be in his pincers, then arch his stinger-tipped tail and inject poison. His manner was that of a meticulous doctor giving a hypodermic. He turned his victim this way and that, precisely searching out the right spot before he made the injection. (The "right spot" usually was the center of the thorax.) But once the poison had taken effect, Tweezers was anything but meticulous. His eating was gross in the extreme. He would switch his dinner from one pincer to the other, and tear at

By RUTH KIRK

Photographs by Louie Kirk



The scorpion was named Tweezers by the Kirk boys because of his stout pincers. Here he stings a cricket preparatory to eating it.

it with his mandibles, letting the juice dribble, and he would spit out little balls of exoskeleton that he evidently could not digest.

We had had Tweezers several months when I began working with the oldest of the local Shoshone Indians on a language study. One day, to boast my vocabulary, I remarked to Old John in Shoshone, "My pet eats spiders."

"What kind of pet you have?" he demanded, wrinkling his leathery brow.

"A scorpion," I answered with exaggerated casualness.

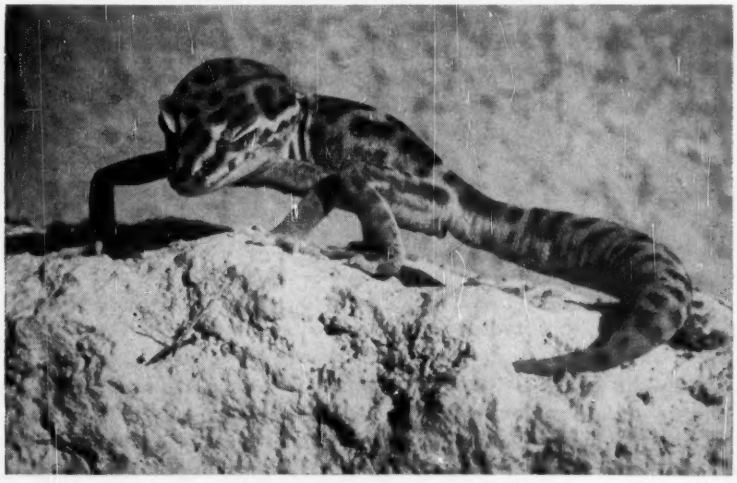
"That no *bongo!*" he thundered. "That *duwahsobee*, 'one who lashes out with his tail.' "

Neither John nor the other Indians ever rated Tweezers a valid *bongo*. We had the horned toad and gecko lizard by that time, and they accepted them with amused indulgence when I took them along to the Indian village to feed on flies. But a scorpion! They made it plain that they did not want such an animal around, even in a jar, and I never could convince them that the sting of a Death Valley scorpion is no worse than that of a wasp.

We tried to keep Tweezers supplied with the soft-bodied insects that he liked best, but sometimes we had to use substitutes. That was why, one fateful day, the boys gave him a darkling beetle, a hard-shelled, inch-long black beetle. Tweezers instantly clasped this supposed dinner in his pincers, turned it over, and arched his tail to sting. Then he dropped the beetle. For some reason, he spurned it as food. But we left it in his jar as a companion—an arrangement that the scorpion evidently resented more deeply than we realized.

The foolish beetle was always on the move, walking around and around the jar, often bumping into the dozing scorpion. Sometimes it would climb on Tweezers from the rear, waking him with a start and causing him to dash around the jar like a mustang, the beetle hanging on wild-west style with all six legs. Or, approaching from the front, the beetle would blunder right into his pincers, whereupon Tweezers would clamp it as a prospective dinner, and then shake it loose when he recognized it.

For a month Tweezers endured this; then he had enough! He set about solving the problem with an intelligence and effectiveness that still seem



The gecko is a slow-moving, delicate-looking lizard, the only one with a voice. It can say "eek" when startled. The pet gecko once embarrassed all by changing his skin in the middle of a company dinner.

impossible, considering the scorpion's humble standing.

In one corner of his square jar, Tweezers excavated a pit, and then waited for the beetle to stumble in, which it did, the next lap around. That started the grim struggle. The beetle clawed its way up the steep incline, floundering as loose sand gave beneath its weight. When it finally gained the top, there was Tweezers! In no time the scorpion would grab the hapless beetle, and fling it back into the pit.

For twelve hours this went on; and then the beetle lay dead at the bottom. Tweezers must have been vastly relieved. But, as fate would have it, his peace proved short. That very afternoon the boys brought home another darkling beetle and put it in with him. The next morning Tweezers was dead. "The first time I ever heard of a scorpion dying of frustration!" was Louie's comment, when he was informed of the sad event.

For a while the Kirks had two horned toads, long enough for them to learn that "Horny" (on the right) was a female. The male lizard never passed the "eating test" so he was turned loose.

The gecko and horned toad that shared the lineup of "pet" jars with Tweezers were only slightly more socially acceptable than the scorpion. In fact, they all caused us social embarrassment.

Louie had a firm rule that none of these creatures was to be kept unless it would eat something within twenty-four hours of being captured. Whatever passed this "eating test" was likely to be kept indefinitely in one of the jars on the kitchen table, but anything that failed was released. Our pets had to be happy.

The gecko took to the arrangement from the start. He burrowed out a home under the rock in his sand-filled pickle jar, curled up, and went to sleep. But when we popped a spider in for the eating test, he was instantly alert. Geck waited for the spider to stand still, then sneaked up, tiptoeing, closer and closer until he was right upon it. A moment's pause, and he snapped it up in his jaws. This sneaking-up was a standard procedure with him. I have even seen him nudge a spider or moth with his nose before grabbing it. Why Geck did that, and why his victims failed to take warning and escape, I never knew.

Geck delighted us. About five inches long and with a pale pink, waxy skin and yellow eyes, he did not look like an ordinary lizard, and his manner was slow and gentle. We were proud of him. But one night we found that not everyone shared our enthusiasm for this little creature. We had invited the new school teacher and his wife to dinner. They had just moved to Death Valley from Los Angeles, so I made a special point of using candles on the table and my good silver and crystal, so as to show them that desert living could be just as refined as city living.

It was a good plan—but misfortune struck right after the shrimp cocktail. I was clearing the first-course dishes and setting them on the kitchen table, when I noticed Geck. He was shedding his skin! It had already split, and he was pulling long ribbons of it from his fleshy tail and eating them. He was gulping down mouthfuls of skin, and then licking his chops, doglike. It was such a fine discovery that I left the baked ham on top of the stove, and carried in Geck's jar instead. Our guests gave a little jump when I placed the lizard in front of them, but, like the rest of us, they watched him strip off his outgrown skin. There was little else for them to do, but afterwards I realized that they probably had not welcomed the performance. The dinner party did not substantiate my contention about the gentility of desert living.

Our other lizard *faux pas* concerned Horny. We were being transferred from Death Valley to Organ Pipe Cactus National Monument, in Arizona. It was May and it was hot, too hot to leave the horned toad closed up in the car when we stopped for lunch, so we carried her in with us. The restaurant was one of the not-much-to-choose-from variety that you go into when it is seventy miles to the next chance. Flies stalked the counter, preening their forelegs as though happy about the filth they carried with them. I was disgusted with the flies and disgruntled with the heat, and I did not care what the waitress thought. I lifted the horned toad from my lap to the counter, saying to Louie, "I'll bet Horny is hungry."

She was. Right away she saw a fly, and made a dash for it. It would have been better if she had used Geck's sneaking-up method, instead of speeding along in her usual way. The counter was slick, and her technique went wrong when she got within an inch of the fly that she meant to stop and catch on her tongue. But momentum carried her past the fly, which, of course, took

flight. Horny slid to a stop a few inches beyond where she had planned, and without realizing her trouble, took sight on another fly, and came careening back down the counter. We thought it was funny. But the waitress did not.

Horny was not a completely happy traveler. The motion of the car evidently seemed like a perpetual earthquake. She was nervous, and I found myself holding her in my hand most of the 600 miles, talking soothingly to her and stroking her hard little head, right over the vestigial eye. By the second day, it occurred to me that a short time before, I had spoken disparagingly of a friend's fuss over an ailing cat; yet here I was, full of tender concern over a nervous horned toad!

We had not really intended to take Horny with us to our new station. Before we left, Louie took her to the hill behind our house to return her to the wild. He gently put her on the ground, walked off a way, and turned for a last look. But there was the horned toad following him. When he stopped, she climbed on one of his boots. Probably she was actually after the shade of his pants cuff, the nearest available protection from the sun. But it was nice to think that she was pleading to continue as a part of our household. At any rate, she moved with us to Organ Pipe, and a year later to our present station at Mount Rainier.

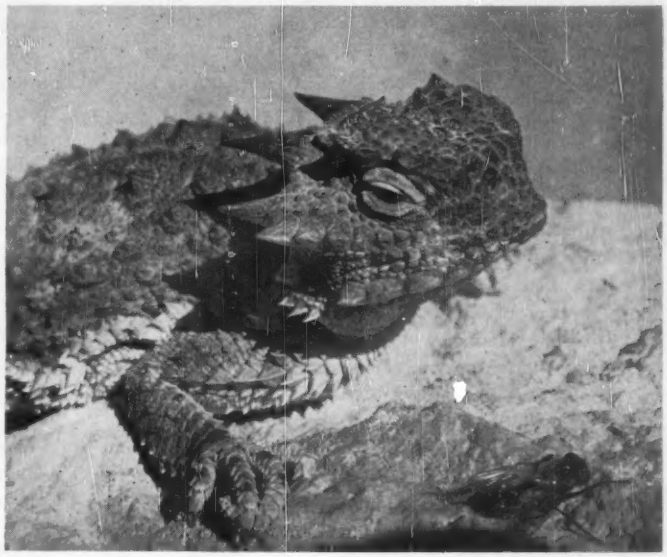
We had misgivings about what the Washington climate might do to her; but it proved a tonic. In Horny's native Death Valley, the annual rainfall is a scant two inches; but she felt better here at Rainier, where the average is close to eighty inches. She did not bother to hibernate during the winter as she had in the desert. Her appetite doubled and tripled, and she became so lively that she would climb the screen of her cage to reach the insects we held out to her.

In fact, she learned this so effectively that it proved her undoing. She found out how to push open the plastic lid and climb down to the floor. We used to let her out on the desk in the evening to get bugs that came to the light, but when she started getting out by herself, we were afraid we might step on her. To prevent that, we made the mistake of weighting the lid with a rock. It fell in one day and hit Horny, paralyzing her hind-quarters. Six weeks later, she died.

We wondered what would take her place in our affections. Our new station, of course, had a new set of wildlife—skunks and raccoons under the house, and bats in the walls—but we were not well acquainted with any of them. The man-like way the 'coons used their hands to pick up raisins from the porch amused us, and we appreciated the way the skunks (actually civet cats) controlled the mouse population, except for one mouse which so continually made its way into the bread drawer that I finally gave up, and left it as a "mouse" drawer. The bats were more difficult to appreciate. They swooped about the bedroom at night, and made strange rasping, hissing noises at the head of our bed, inside the wall. The first few times, Louie thought I was snoring, and I thought it was he!

We did not feel personally acquainted with any wildlife—until Sniffles came along, a fawn just barely old enough to be on his own. He took the friendly initiative by walking in the open door of Louie's workshop, and going over to the wood stove as though purposefully seeking its warmth. None of us had seen him until that snowy afternoon when he came out of the woods, but we saw plenty of him after that, until we had to get rid of him.

We did not pen him, or make any special effort to keep him around; he was a self-appointed pet. On rainy days he particularly sought us out, coming to the porch, whining to be let in and rattling the door knob. He was well behaved in the house, except that he licked everything. One day in the office he liked what he was licking so much that he ate it, causing a state of consternation.



Horny eyes a fly. She would eat nearly any insect but was afraid of ants. She learned to take insects, alive or dead, from the Kirks' fingers; would also take hamburger presented on a finger tip.

It happened on a Monday, the day Louie makes out the official remittance forms to send with the vehicle entry fees that are collected at the park entrance. He was taking the forms out of the typewriter, completed, when a park visitor called him away from the office. Sniffles saw the door open, and went in, and that was the end of the remittance forms. He ate them—the white, yellow, pink and blue copies, plus the carbon paper.

Snif seemed eager for human attention. Often he

Once in the house Sniffles was pleased to find that the Kirk boys had left the bread drawer open. Human food is not good for deer; full of it they neglect the browse that provides them with proper nourishment.

waited with the children for the school bus; once he climbed aboard, and protested with a mournful *baaa* and stiffened legs when the driver pushed him off. When the snow plow came, he stayed so much in the way that the men often took him in the cab in order to get on with their work. Once he astounded tourists by climbing into the station wagon of some people who had stopped to take pictures of other deer, and in their excitement had gone off with their car door open. Sniffles climbed in, flopped over the front seat to the back, and over it to the rear of the station wagon and the picnic hamper. A traffic jam quickly ensued, with everyone delighted by the sight of a deer inside a car, especially while the owners were off stalking some less forward deer. Unfortunately, when the people got back and found the ravaged lunch, they were so indignant that they dragged Snif out the tailgate by his hind legs, without even taking *his* picture.

Inevitably, the desire for human food harms a deer. Sniffles turned into the sorriest looking animal in the park, his coat lusterless and the hair gone from his ears and nose. He stood daily in the road, panhandling potato chips and cookies from passing tourists and staying for their attention even after he was too stuffed to eat.

By the second year this begging grew so insistent that he was jumping up. At first the jumping was puppy-like, even affectionate; then it progressed to striking, his hooves slicing the air with the full weight of his 200 pounds. Louie was the only one he respected. He struck at him once, but when Louie grabbed his hind legs and threw him to the ground as if he were a rodeo steer, Snif learned his lesson. Ever after that, he would brace his legs and give a baleful look when he saw Louie coming, evidently remembering the affront to his dignity.

Such a situation could not be allowed to continue. The boys were afraid to go out of the house; Sniffles would attack them on their bikes. Once he challenged our car, butting it like a goat. He still craved affection, however, and more often than not he nuzzled us simply for a pat. But, like most "tame" wild deer, he could not be trusted.

We had to get rid of him. Arrangements were made with a nearby powder factory that maintained a deer herd, and when the truck came, Sniffles went willingly. We worried about his being lonely with nothing except other deer as associates. Then we heard that workmen were having trouble with their lunches being rifled when they got them from the cloakroom each noon. They were puzzled, until the day someone passed the open door of the cloakroom and caught Sniffles in the act! We need not have worried.

"What next?" we wondered, after Snif had gone. Then the boys came home with five baby mice whose mother had been trapped in a neighbor's house. "It won't be any trouble to take care of these while we're at school, will it, Mom?" they asked.

And so every three or four hours now, I find myself warming sweetened milk, and one by one feeding those tiny, still-blind mice. "What next?" is still a good question, of course. What will we do with mature mice? Perhaps they will fit into life in the "mouse" drawer, that bread drawer that the civet cats neglect. Or maybe we will just take them back to the neighbor's, and turn them loose!

DEER IN CAPTIVITY

Here is the stream, crystal-clear and cool,
Here is the breath of summer in drying hay,
But you once knew a shadowed hidden pool,
A deep and windless forest where the way
Of man is strange and alien. Now you are secure,
Sheltered from winter cold and summer heat,
But wild hearts long for hunger to endure,
Where danger lies in wait, where death is fleet.

Alma Robison Higbee

PHOTOGRAPH COURTESY ROSS ALLEN'S REPTILE INSTITUTE

Early Spanish explorers of the New World referred to alligators as "terrible lizards;" and the naturalist William Bartram after a journey through the southern United States in the eighteenth century, reported that Florida's St. Johns River was so thick with alligators that he could have crossed it by walking on their backs.

There is a place in Nature's scheme for the

Living Fossil of the Swamp

By GEORGE S. FICHTER

I HAD MY first experience with an alligator while I was on combat training in Florida, during World War II. Included in our daily routine was a stint around an obstacle course, and on the final stretch there was a broad, shallow pool across which we were supposed to swing on a rope. But by the time we reached this leg of the jaunt we were hot and sweaty, and so nearly every GI did the expected—he swung to the middle and dropped in.

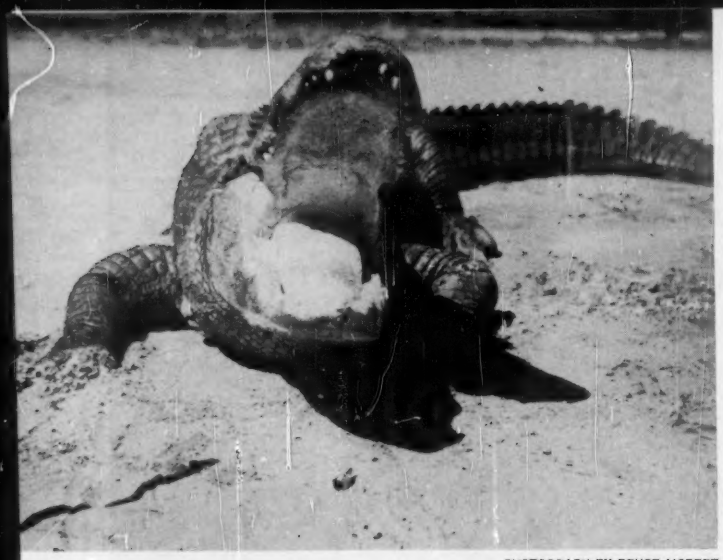
Then, one day, the enterprising second lieutenant in charge of the course requisitioned an alligator, and put it in the pool. It was not a big fellow, as 'gators go, but neither did we know how well fed it was.

From that day on GIs left the ground a full fifteen feet from the water's edge, and soared high above the pool. And they sprawled flat in the dust twenty feet or more on the other side, making certain they were safe from the 'gator's jaws.

The truth is, I never saw the alligator show any interest at all in the humanity hurtling overhead. It lay stretched on the bank, disinterested and motionless, either asleep or quietly soaking up the warm sun. But so fearsome is the alligator's appearance, and so frightening its reputation, that the mere presence of one was enough to stimulate us.

The early Spanish explorers referred to the monsters as "terrible lizards," and their lurid descriptions added little to the appeal of the New World. In those days alligators, which are members of the crocodile family and are not giant lizards, existed in almost unbelievable numbers, not only in Florida but as far north as the Carolinas and west to the Rio Grande. No animal contested their supremacy in the swamps. When the naturalist William Bartram logged his journey through the southern United States in the 1700's, he reported that alligators were so thick in the St. Johns River he could have crossed the broad stream by walking on their backs. He complained that their noisy grunting and loud bellowing kept him awake at night, and said that some of the fearsome creatures measured twenty feet in length.

Beaten back by civilization and hunted heavily for their thick hides, alligators are today common only in and near Georgia's giant Okefenokee Swamp, in the



PHOTOGRAPH BY BRUCE MOZERT

The jaws of a full-grown alligator can snap shut with tremendous force, and prey that is too large to swallow whole is jerked back and forth so violently that it is torn to pieces. The muscles that open the jaws, however, are so weak that a man can keep an alligator's jaws closed by gripping them firmly.

Louisiana bayous, and in the warm and watery interior of Florida. Included in this latter area is, of course, the vast acreage of Everglades National Park, where the considerable alligator population is safe from the menace of the hide-hunter. For a time, however, it seemed that the alligator might eventually follow the passenger pigeon into oblivion. So great was the demand for skins that a quarter of a million animals were killed every year.

Hunters generally go after their alligators at night, moving silently along the waterways and probing the banks with bright-beamed headlamps. At 300 feet an alligator's eyes gleam ruby red, seeming as bright as the tail lights on an automobile. If the eyes are widely separated, indicating a big head and hence a worthwhile length of body behind it, the hunters move in to a sure firing range and make their kill.

On a good night, two experienced hunters may kill as many as a dozen alligators in this manner. None are as large as the twenty-foot giants Bartram wrote about, and not many measure more than ten feet in length. In fact, the largest alligators in Florida today are apparently those few in captivity that are more than fourteen feet long. Only the 'gators in well-stretched stories have exceeded this length in recent years.

Other hunters "grunt up" their 'gators. An alligator's grunt is a throaty sound, something like the deep gurgling croak of a bullfrog combined with the bass whimpering of a hound dog. The animals become inquisitive when they hear this sound, and will move toward it swiftly. Big ones may be wary, but baby 'gators, in demand as pets, can be sacked by the dozens by a good grunter.

Late in the 1940's, a group of conservationists convinced Florida lawmakers that alligators could not withstand the continued slaughter. A law was passed making it illegal, in some counties, to kill alligators of any size. Others have an eight-month open season on alligators more than six feet long. They also made it unlawful to sell baby 'gators for pets, and so those you can buy in Florida today are not really alligators at all. They are the closely related caymans imported from South America and the West Indies.

Conservationists gave two good reasons for protecting the alligator. One was its value as a tourist attraction. Of more importance, however, is the fact that the alligator fits a definite niche in sub-tropical Florida, where there are just two seasons—the wet and the dry. In the vast saw-grass prairies and across the great open ranges—wherever there is no natural, permanent body of water—the alligator holes may be the only year-round water supply. Here, during the dry months, wandering cattle come to quench their thirst, along with deer, bear, rabbits, quail, turkeys, otters, raccoons, songbirds, or waterfowl. At the 'gator holes they may get the only drinks they will have until the rains come again.

An alligator makes his hole in the bank of a pond or a stream or under the roots of a big tree. With his teeth he tears away the tangle of roots, and loosens the dirt with his flat, shovel-like snout. Then he kicks this material behind him with his feet, and swirls it away with his tail, kept constantly swinging back and forth. The result is a cave, with the entrance under water and with a broad, deep pool in front which serves as a sort of reservoir.

Here the big alligators spend most of their time,

PHOTOGRAPH BY TOD SWALM

This alligator nest, constructed against the base of a cypress tree, is built of mud, leaves, twigs, sticks and other debris obtainable on the ground. The yardstick in the foreground gives an indication of the size of the nest, which is usually built near the den of the reptile.

leaving only when in need of food, or when they are on the prowl for a mate. Here both young and adults congregate during the cold spells of winter, when alligators become sluggish and live mostly from stored-up fat of heavy summer feeds. And here, during the dry spells, the 'gator has plenty of water in its own well.

Sometimes these dens are so thin-roofed they will cave in when you walk across them, but if you are observant you can spot a cave's location at a good distance. Vegetation grows lushly there, and stays green even during the dry season when the surrounding country is burned up under a blistering sun. The water supply is steady at a good cave, and there is also rich nourishment from the accumulation of organic wastes.

Alligators figure strongly in natural mosquito control in swamp country. Their holes are lay-over spots for millions of tiny minnows during the dry months, and when the rains fall and water floods the land again, these fast-breeding little fish spill out to populate every ditch and puddle. They gorge themselves on enormous quantities of mosquito larvae that would otherwise develop into unbearable swarms of biting adults. And the minnows are helped in the chore by frogs and toads that also spend the dry season at the 'gator holes.

PHOTOGRAPH BY HIRAM J. HERBERT

The female alligator lays her eggs in several layers near the surface of the nest, separating the layers with vegetation, and they remain without further attention. Fermentation of the debris furnishes the heat for incubation, and the eggs hatch after about eight weeks into eight-inch youngsters.

In the few years since they have been protected by law, alligators in Florida have increased, and have also moved in closer and closer to towns. You can stand on the bridges of many well-traveled highways and spot them sunning themselves along the bank. Or a native, who can see a hundred to your one because he knows what to look for, will point out in the water below you the tiny raised-up tip of a 'gator's snout and the two bulbs of its eyes as the reptile glides along, leaving almost no wake.

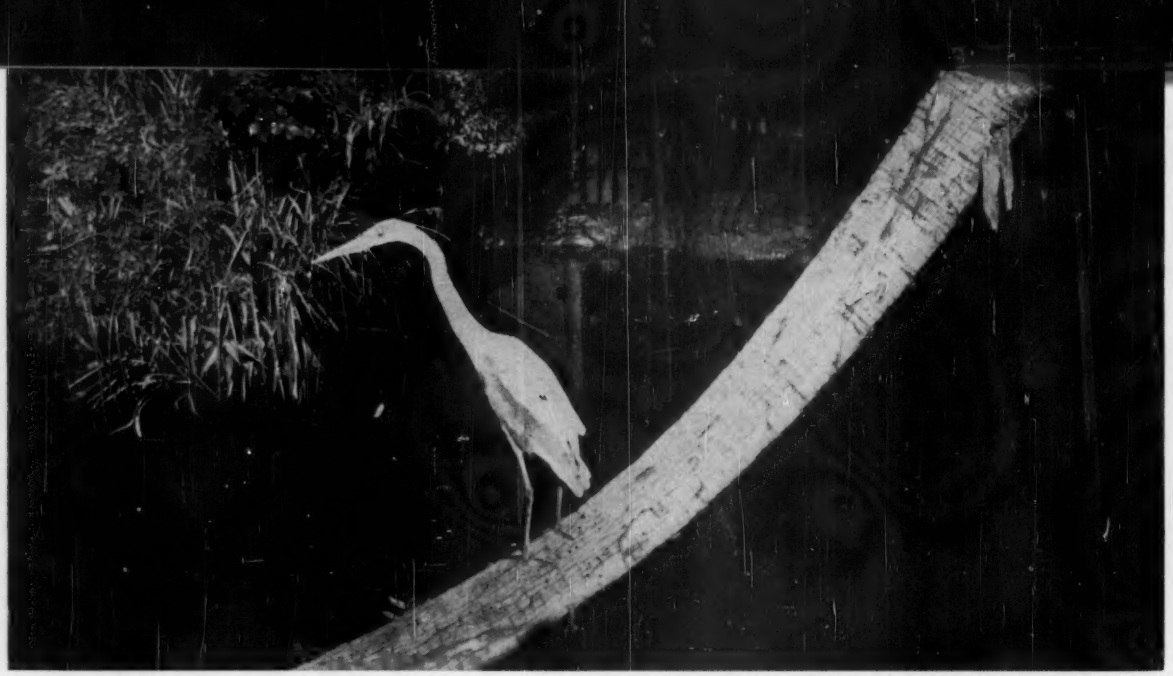
Here and there, these in-town alligators have become nuisances. Last summer, for example, a four-footer somehow got through a fence and took up residence in a private swimming pool at Fort Lauderdale. At Fort Myers, a few seasons ago, a similar-sized specimen stretched out early one morning in front of the ticket window at the theater. A Bradenton attorney lost a valuable bird dog last year when an alligator came out of Ware's Creek, stalked his sleeping dog in broad daylight, and snapped it almost in two. And in many towns business has gotten off to a slow start in the morning while officials herded from the streets one or more bewildered 'gators caught by daylight before they could find their way back to water, after a night of prowling.

When the mangled body of a nine-year-old boy was found along the banks of Horse Creek near his home in Eau Gallie last summer, angry citizens killed an eleven and one-half foot bull 'gator and found inside its stomach parts of the boy's body. Not far from the bull they got an eight-foot female, and in her stomach, too, there was telltale evidence. The Game and Fresh Water Fish Commission opened up 'gator hunting at Eau Gallie and in the surrounding counties to all alligators more than six feet long. State and national authorities believed, however, that most likely the boy fell into the creek and was drowned before being attacked by the alligators.

A big alligator is no plaything. It deserves all the respect you can give it. Small ones are probably harmless, unless greatly provoked. But an alligator more than six feet long has an enormous appetite, tremendous power, and a short temper. Furthermore, it is not the slow-moving, sluggish creature it appears to be. Especially to be avoided are 'gators that have been half-tamed. They are half-friendly, sometimes fed and sometimes left to their own devices. This is frustrating to the alligators, and they become brazen in their approaches. To tease them is to invite disaster.

An angry alligator hisses and attacks with a short, fast lunge, its mouth wide open. But out in the wild, an alligator is like a reluctant dragon. At the slightest sound it drops into the water and disappears. Or it runs—and it can shrink a hundred yards faster than a man can.

Both sexes, but especially the bulls, wander during the spring mating period. You can follow their trails



PHOTOGRAPH BY ROSS ALLEN'S REPTILE INSTITUTE

A Ward's heron keeps a watchful eye on the alligator in background. These herons often prey on hatchling alligators.

through the woods from pond to pond, for their heavy bodies sink deep in the soft ground, and the same trails are used again and again. A bull may mate several times during the season, and if he comes to a pond occupied by another bull, he generally challenges it to a fight.

Male alligators may bellow any time during the year, but they become most noisy at mating time. Presumably, this is the challenge of the bulls to battle. Standing in shallow water, the bull rises high on his legs and inhales deeply several times, actually swelling his body as he does so. At the same time, a fine mist is expelled from the musk glands under his chin, sending its alluring perfumery over the swamp. Then he lifts his head high, and forces the air out of his lipless and almost leering mouth. The result is a deep booming noise, halfway between the roar of a lion and the bellow of a bull, which, on a still night, can be heard a mile or more. At the peak of the bellow, the bull's body actually vibrates, and if you are close you can feel the ground tremble beneath your feet. Slowly the great body deflates, and the animal sinks down into the water again.

The female builds her nest by carrying a variety of vegetation—sticks, bull ferns, wampi fronds, flags, or anything loose that can be picked up—to the spot of higher ground she has selected. When the pile is as much as three feet high, she climbs on it and kicks out a depression, where she lays several dozen eggs that look like long and leathery hen's eggs, covering them with debris. High above the water level, the eggs are incubated by the heat of decaying debris and the sun.

HIRAM J. HERBERT PHOTOGRAPH

Two painted terrapins find an alligator a convenient resting place. The 'gator shows no sign of resentment.

For nearly two months the mother alligator lies nearby on guard. Then one day there is a stirring in the eggs, and the about-to-hatch babies begin grunting. The mother 'gator returns the grunts as she climbs to the top of the heap again, and removes the top of the nest so that the little 'gators can make their way out.

When you look at a full-grown alligator, it is difficult to believe that it had such a meager beginning in life—that at one time it was only six or eight inches long. But you can never say that an alligator came into life helpless. It actually charges from the egg ready for a fight. Its jaws are equipped with a full set of needle-sharp teeth that it will sink into anything moving within range—even if it is a brother or a sister. For the first few days, the babies need no food, for they come from the egg with paunched stomachs, stuffed with the remaining yolk from the egg-sac. As soon as this is absorbed, they begin eating heartily, thriving on crayfish, frogs, and small fish.

Left to forage for themselves from the start, few survive their first year. Most of them are eaten by other creatures of the swamp, but those that do live through this most dangerous year in an alligator's life will measure about a foot and one-half in length and weigh half a pound.

By the end of the third year, they are nearing four feet in length, and may weigh fifteen pounds. Two years later they are ready to mate, and if they have fed well, they are also approaching the critical six-foot length when, in many Florida counties, they are legal length for killing. At this size, too, they have a capacity for (*Continued on page 50*)

Ellen Louise Dunlap will be eighty-four years young on January 15, 1958. Born in Chillicothe, Missouri, she graduated from the academy there, later moving to Texas with her mother and older brother. In his photographic studio she learned portrait photography and became an expert retoucher. Receiving an unexpected legacy in 1904, she went to Europe, despite family disapproval, to study art. She painted furiously in Holland, Spain and England until her money ran out. Returning home, she became an accomplished etcher.

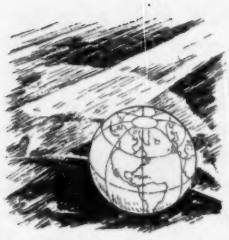
Nature had been a lifelong interest with Aunt Nellie. Reproved one day, when ten, for interrupting callers to show off her insect collection, she took revenge by dumping her entire collection of live frogs, turtles, snakes and mice on the living room floor. She says today that whatever punishment she got it was worth it. In her seventies Aunt Nellie took a course in mineralogy and became an active rockhound, scouring the desert from Los Angeles, where she now lives, for adventure and minerals. She also panned for gold.

One day Aunt Nellie sent to her niece, Sylvia K. Schnable of Westfield, New Jersey, a number of word sketches. Mrs. Schnable sent these to us, and we felt that Aunt Nellie had distilled from her full life thoughts that are worth passing on to others. So, in the paragraphs that follow, it is Aunt Nellie Dunlap speaking.

From Aunt Nellie's Notebook

By ELLEN L. DUNLAP

Illustrated by Garnet Jex



THE BUILDING OF THE EARTH was dramatic beyond our imagination. The shaping of the continents and the ocean depths required titanic convulsions. The Supreme One did not shout the Earth into instant being any more than an architect would order the instant erection of a skyscraper. The ground work must be laid, and, little by little, the job progresses. It required several billions of years to make the Earth what it is today, and the job is not yet done.

In the beginning the air was filled with gases, and the waters were filled with all sorts of elements in solution. Minute organisms tackled the job of clearing the waters and the air. Some of these organisms became plants to absorb carbon, and some became animal organisms to absorb the metals, and, in dying, deposited these bits of metal in insoluble form. In Earth convulsions these bits of metal found their way into fissures and became mineral veins.

The little organisms at first reproduced by fission or by budding; then they became modified into male and female. This gave the little ones an interest in life besides just food.

The process of clearing the waters is still going on. The coral polyp secretes lime from sea water and, in dying, leaves its skeleton as a speck of lime on a coral reef. It never knew it was helping to build an island. It just did the job assigned to it. Coral reefs, besides lime, contain silver and gold. Mollusks contain copper. Some sea plants contain lead, and iron is found in every living thing. Do not despise these little ones; but for their labors we would not be here.

In every geological age plants and animals are evolved to do the necessary job for that age, and we are heirs to all that has gone before; and we are here to do our job for those who come after us.

* * *

AFTER A SHORT CLIMB up the mountain, I sat down to rest. It was a perfect day, clear and still and pleasantly warm. I could look out over the valley to blue hills beyond. All was still except for an occasional bird chirp, and the hum of a few bees. The faint song of the mountain became audible. Yes, mountains sing! A blind man with sharp ears could tell from the tone which mountain he was on.

In taking a drink from the canteen I spilled a drop of water. Right away two bees dived down to suck up the moisture. I poured some water into the gold pan and soon had plenty of bees. The poor things were

thirsty after their long hours of labor. I closed my hand over one of the bees. It explored the whole inside of my fist, trying to find the exit, but it did not sting. When I opened my hand it dived to the pan for another drink, then flew off about its business of honey-making.

Another sound; quail coming up the slope. I sat still, and they passed close by me, eighteen of them, talking happily in quail language and walking sedately as a group of nice people on their way to Sunday meeting.

And the mountain sang on.

* * *

LATE IN THE AFTERNOON I was coming down from the mountain on a narrow trail, a steep bluff on one side and a deep gorge on the other side. A rattlesnake was coiled right in the middle of the trail. There was no room to pass on either side of the snake without coming within striking distance. I had no way of killing it, and anyhow I did not want to kill it. The snake has its place in the economy of Nature. I had never been so close to one before, and I was interested in looking it over and admiring its markings. I talked softly to it and called it "pretty thing."

We had quite a lengthy conversation—talk, rattle; rattle, talk. Finally I started to sing. That was too much for it. It promptly uncoiled and slid down into the gulch and gave me the trail.

* * *

ANIMALS ON A FARM feel that they are all members of the family, and they get along together as members of a nice family should. They are proud to be petted and fed. The petting means as much to them as the food. They feel that they are quite superior to the wild things slinking around in the woods, hunted and hated and often hungry. Not for anything would the cats catch the little chickens. The chickens are members of the family and should be treated as members of a nice family should be treated. It looked strange to see the pet bob cat snuggle up to the back of the collie dog, bury her nose in his long hair and nap with him. Perhaps it was no stranger than to see one of the dogs go across the road to the pasture and lick the feet of one of the horses and the horse would nuzzle the dog, then they would run and play.

The family had plenty of milk to feed the animals. When a big pan of milk was set out, there was no greedy growling nor pushing. There was plenty for all, and all took their turns in a nice, civilized way. The chickens came first. When the chickens had all they wanted, then the cats came. I counted nineteen cats lapping up milk at one time. The dogs would walk around with their tongues hanging out until the last cat left; then the dogs would come for theirs. There was no horning in out of turn. Even the bob cat was as mannerly as the house cats.

The cats were kept to keep down the field mice. They would go out at night and hunt field mice. The dogs were kept to give the alarm if prowlers came on the place at night. Also the dogs would help round up the cows at milking time.

Bobbie, the bob cat, had been orphaned before she had her eyes open. The farmer found her, blind and hungry, and took her home and put her with a house cat to nurse, along with the house cat's litter of kittens. So Bobbie grew up thinking she was a house cat and one of the farmer's family. She was the most affectionate animal on the place and never could get enough of petting. At early dawn she would go into the house and jump in bed with the farm couple and lick first one face then the other, telling them it was time to get up. She liked to slip up behind me, when I was standing or walking, and leap on my shoulders. She wanted attention. All animals, from humans to rattlesnakes like to be petted.

When Bobbie was stolen, the farm couple were heartbroken. They advertised and offered a reward but they never got her back. Maybe she eloped. She was getting big enough to have some ideas of her own. There was a colony of bob cats five miles back in the mountains.

* * *

ONE TIME WHEN I was sketching in the desert, I found just the view I wanted, and there was a bare patch of ground where I could sit. I was getting well into the drawing when the ants swarmed over me. I was sitting on an ant hill. They took a few nips at me. I did not slap at them, and they decided that I was neither edible nor dangerous. However, they were curious. They explored me from toes to scalp; to them I was a new and interesting species. When I was through with the sketch, I got up and shook myself, and they all dropped off. They did not want to go home with me.

Another time, when I accidentally drove my prospector's pick into an ant hill, they swarmed. These ants were not curious but furious. I ran; they bit. Some of them stuck to me and bit and bit until I was almost home.

In the park I was watching a small ant carrying something in its mandibles almost as big as itself. It came to an obstruction that it could not get over, or under, or through. It studied the situation for a moment then detoured. It got into its path and went on in exactly the same direction it had been traveling.

I watched a woman in one of the national parks playing with some very small ants. She put a peanut down for them. They tugged and struggled to get it to their nest but they could not get it over the rough ground. She tied a thread around the peanut, leaving about two

inches of thread ends sticking out. The ants came again and examined the thread all around and the two thread ends. Then they stood in a huddle as though they were thinking it over.

All at once three ants grabbed one thread and three grabbed the other thread, and they started pulling. All the others got behind and pushed. They trotted right along home with their peanut. Their tiny brain is no bigger than the point of a fine needle but they seem to have a way to tap the Universal Intelligence.

* * *

WHAT A BEAUTIFUL OLD WORLD this is—stars twinkling at night, the warm sun by day, fresh air in our lungs, the four seasons, the grass, the trees, birds chirping, bees humming. To lie on the grass and feel the earth currents coursing through you—what a privilege just to live! The glorious colors as the sun rises and sets, the blessed rain and rainbow, the intricate pattern of a snowflake, makes one wonder at the perfect artistry of the Creator. There are no two things exactly alike in Nature; no mass production. That is not an artist's way. There are no two blades of grass alike; no two people alike.

Life in our Garden of Eden is a thrilling adventure, a drama and a song.

Our shoddy Tower of Babel civilization, with its misfit brick and paper flowers, is bound to fall but the blessed old Earth with all of her natural beauty will roll on.

* * *

ALL THINGS, FROM STONES TO HUMANS, have their patterns, to which they grow. The pattern is the life. Material is built in accordance to pattern. Crush and dissolve a quartz crystal and give it the right conditions, it will grow again. The growing of quartz crystals was quite a chore during the Second World War. Now some gemologists are experimenting with the growing of gem stones.

A clam shell was found on the beach with a hole broken in the shoulder of the shell. Inside the shell the clam had grown a tiny shell over the hole and sealed it perfectly. Chip off the leg or eye of a crawfish, and it will grow a new leg or eye. Injure your flesh and new flesh will grow and heal the wound.

Evolution means the changing of the pattern to fit the changing conditions of the earth. Types that are worthless become extinct. Paleontologists claim that more fossil species have been found than there are living species on the earth today.

A craftsman uses a good pattern over and over with slight alterations and improvements. A worthless pattern is destroyed. There is no reason to perpetuate errors.

How beautifully perfect are the little flowers on the desert, perfect in every microscopic detail! What a sense of beauty the Creator has! Since you cannot take more out of a bag than there is in it, when I see a Joshua tree or a turtle, I think the Creator has also a sense of humor and must have his little joke. However, the Joshua redeems itself in the spring by putting out an immense bunch of white lilies at the end of each crooked branch.

Jesus was the perfect pattern for the human race. Both Jesus and St. Paul were of the order of Melchizedek, an ethical religious order that circled the world before Abraham. Judaism has largely replaced, in the modern world, this most ethical philosophy, although some of it has come down through Masonry.

* * *

DAWN. THE STARS FADE, and there is a chirping of birds as the East lights up. Soon everything is on the move. The rising sun kisses the tops of the mountains to the West, and they blush. Rose and violet give way to greens and grays. The most beautiful little flowers open their petals and sprinkle the desert floor with bits of white, pink and yellow. Mammals, birds and insects have started on their activity of the day. A snake catches and devours a field mouse. A rabbit devours a garden; a fox devours the rabbit. So the Balance of Nature is maintained.

Down in the Marango Valley there is a colony of poultry raisers. Occasionally a fox would grab a chicken. The Government thought that would never do, so they sent out experts to kill all the foxes in the Valley. Then the rabbits took over and ate all the growing crops, so the farmers had no feed for their chickens. Now the farmers are praying for the foxes to come back and eat the rabbits. Muddling Man, "so scientific," upset the Balance of Nature.

Bees and other insects are flitting from flower to flower to sip the nectar and to carry pollen. Birds are catching insects to drop into the big mouths of their young ones.

In the middle of the day the mountains are gray with violet in the shadows. Most of the wildlife, as well as the humans, takes a siesta. Maybe an eagle swoops down on a resting animal, or a hawk grabs a chicken. A buzzard soars overhead, looking for carrion.

The drowsy afternoon wears on; then activity starts again. Mammals come in from their harvest and scurry home. Birds sing their evening song. The low sun paints the hills to the East rose and violet. To look across miles and miles of desert to a snow-capped mountain peeping over the horizon, the white snow turning pink, makes your heart jump up in your throat. To the West are the blazing colors of the setting sun, first yellow, orange, red, fading into gray. The evening star appears, and the Day is done.

The author has reason to suspect that Coo, the friendly mourning dove who has been chronicled in a past issue of Nature Magazine, has been spending his winters comfortably in the Mexican State of Michoacan.

Coo Comes Home Again

By BEULAH WOODS ALLEN

Photograph by Ralph Lester

Coo was first introduced to the readers of *Nature Magazine* in an article entitled "The Love of a Dove," which recorded the friendly exploits of this mourning dove and his return to us, still friendly, in 1956; a red letter day for us.

I am happy to report that our calendar now sports two red letter days. On the morning of May 8, 1957, six weeks later than his return the previous year, Coo came back into our lives.

While with us, he had three romances and raised three families, and then again, in September, Coo took off for the winter. Where does he go? For the first time we have a clue.

Mr. C. F. Marshall, the licensed bird-bander who banded Coo, at the same time banded young mourning doves in his own yard, only a few blocks from our house. In the spring of 1957 he was notified by the U. S. Fish and Wildlife Service that two of the banded doves had been shot. Their numbered aluminum bands had been mailed from the hotel Pasada Del Sol, in Apatzingan, Michoacan, Mexico.

If doves from Mr. Marshall's yard migrate to Mexico, then, we reasoned, it is entirely possible that Coo migrates there also. We like to believe it is so, for a dove who chooses to spend the winter in the Mexican state of Michoacan shows uncommon good sense.

Michoacan is a beautiful lake region, and is celebrated for its forests. It has a variety of altitudes, a healthful climate, and is divided into three temperature zones—cold, temperate, and hot. Although the numbered bands were mailed from Apatzingan, which is exotic and tropical, these doves may have been shot near Patzcuaro or Uruapan, not too far distant, and both in the temperate zone, where small grains are plentiful.

Patzcuaro, in Indian, means "Place of Delights." Here doves from Oklahoma, and possibly Coo, have winged their way across Lake Patzcuaro, said to be one of the most beautiful, and the highest lake in the world. Those doves no doubt flew above, and looked down on the Tarascan Indians fishing there with their picturesque wide-spread butterfly nets.

We like to think of Coo as residing in what is perhaps the loveliest public garden in all Mexico. It is near the entrance of Uruapan, the paradise of Michoacan, located on the Cupatitzio, or Singing River.

The guide books advise homo sapiens to visit Michoacan between October and March, not only because of perfect weather, but because of abundant wildlife. Oddly, although I know not the nature of the mourning doves' guide, this is the approximate time of Coo's absence.

If Coo does travel to Mexico in winter, his ease of travel makes me green with envy. He needs no passport, no ticket, no money, no luggage, no nothing. He goes by air, in his self-propelled plane, traveling on what I believe might be called the great Pan-American flyway.

On reconsidering, I take it all back about the envy. When I go to Mexico, I can relax. I have no fear of being shot down.

Jens Jensen and "The Clearing"

By VIRGINIA S. EIFERT

Photographs by the Author except as credited

PHOTOGRAPH BY ALICE DROUT

Jens Jensen
1860-1951

TO TEACH an understanding of the soil and a comprehension of the true meaning of man's innate heritage bequeathed him by Nature, to learn from trees and be inspired by rocks, Jens Jensen's adult education camp, "The Clearing," was begun in northern Wisconsin twenty-two years ago. That it is still successfully teaching these truths is a monument not only to the man who believed in them, but to the trees themselves.

Jens Jensen was a spirited, spunky, often furious, tall, thin, twinkling-eyed, dedicated Dane, a landscape artist who believed in the goodness of the land. From 1935 to 1951, the names of Jensen and "The Clearing" were synonymous. They still are. The personalities of man and trees are still both strongly and subtly present.

Although the place is called "The Clearing," it is paradoxical that these 120 acres are mostly trees, with the cleared portion only a little meadow filled with sun and grass to contrast refreshingly with the depth of forest. It is only a small clearing, but it could have been devastatingly greater, for almost everything has happened to these woods that can befall a stand of trees. The name, however, did not derive from a cutting of these trees, but from a clearing of the mind, which is the basic purpose of the school.

"The Clearing" is located near the tip of Door County, Wisconsin, on a rocky thumb thrusting northeastward into Lake Michigan, with Green Bay in the curve separating the peninsula from upper Michigan. The county was so named for the perilous stretch of water lying between the tip of this rocky point and Washington Island, a short distance out. The Indians knew these straits as the "Door of Death," for many lost their lives there. The French christened it *Port des Morts*, and Door of Death County finally was shortened to Door County. The area was becoming a well-loved vacation center, as well as a cherry-growing area, and, palpably, the words "Door of Death" did not sound particu-

The lodge, built of native limestone, blends harmoniously with the surrounding woods. To the left are the guest rooms and the director's quarters, while the lounge and dining room are to the right, with the kitchen below.

Students in the Nature course at "The Clearing" gather for a morning's walk. In the left foreground is Rutherford Platt, noted naturalist and author, while Mertha Fulkerson, the resident director, is second from the left in the foreground.

larly alluring when employed in resort advertisements!

Door County is an outthrust of the Niagara Escarpment. This great limestone ledge extends boldly into Lake Michigan, slanting off into the lake, then rising briefly again as Washington Island. The limestone is in many bedded layers, marking where an ancient coral reef degenerated to muds in the receding arm of a sea lying there long ago.

There is little chance to discover what lived or grew on this great white cliff, eighty miles long, before the Ice Age. We do know, however, that the flow of glacial ice must have swept the rock clean of earth and plants, not once but several times. There was no opportunity for development of a deep, rich soil to sustain great forests such as grew elsewhere in much of northern America.

It was not until the final ice had departed, less than 9000 years ago, that trees came back to reforest Door County. On the wind-swept, winter-punished end of the peninsula, arbor vitae trees somehow gained a foothold above lake and bay, while, a little way inland, as soil developed, other trees came back. There must have been birches and aspens, then balsams, then bigger trees. When the Indians knew the Door of Death, and when Father Marquette and Louis Jolliet came that way on their journey to seek the Mississippi, there must have been climax forests of sugar maple and beech, and of white pine, red pine and hemlock, but probably none were as huge as in those better-nourished forests of Wisconsin and Michigan.

Sometimes fires, set by lightning, swept the peninsula. And, in the nineteenth century, the logging crews arrived. They were accustomed to the tremendous timber of the mainland, and Door County trees were small stuff in comparison. Consequently, the beech, maple and pine were reduced to lengths suitable for stovewood, and loaded on sailing ships, bound for the stoves and fireplaces of Chicago and Milwaukee. For some time, the homes in these cities were warmed by the trees of Door County, Wisconsin.

Yet forests, even ice-hewn, fire-ruined, and man-killed, if given only a little chance, a little time, come back. And so once more the patient cycle began. Although fires came again and again, the arbor vitaes, still clutching the ledges of the northwest cliffs, were not easily destroyed. Their trunks might char, their branches might scorch, half their leaves might be burned, but most of the trees lived on. Growth rings were added on top of the charred wood, enclosing the burn as a secret held within the trees. Their gnarled roots groped for sustenance in the cracks of the ledges. These trees are still there, holding fast.

In 1935, Jens Jensen, seventy-five and retiring from his work in Chicago, acquired 120 acres of land lying just above the village of Ellison Bay, a few miles from the very tip of Door County, on the side where Green Bay becomes open lake. He named his land "The Clearing." The old arbor vitaes and the renewed woodland were now his to foster and protect.

Mr. Jensen was an eminent landscape architect who had become noted both here and abroad for his work in designing many of the Chicago parks and the Chicago Forest Preserves, as well as the Abraham Lincoln Memorial Gardens at Springfield, Illinois, and other parks and plantings. He was also a commissioner of the Chicago Art Institute for many years. He was one of the first to insist upon using native trees, shrubs and

On a sunny May morning, students work in the woods reducing standing brush to ground level—a practice that gives the "lumber crew" appetites most extraordinary.

Below "The Clearing," the sheer limestone bluff meets the dazzling white rocks of the shore. On the ledge, the arbor vitaes, wind-twisted and scarred by fire, hang low, but manage to keep their rootholds.

wild flowers in landscaping, instead of utilizing exotics and imported species to emulate gardens of the Old World. In his adopted country, he was fiercely American, and wanted to bring out the best in America's wonderfully varied wild life.

To teach this belief, and to foster an understanding of the soil and our wildlife heritage, he built a school at "The Clearing." At one time, students lived there the whole year around, doing the work and learning from Jensen something of the secrets of natural successions and the indestructibility of Nature.

Today, using the handsome, low, stone studio-school whose windows look out to bay and woods, the beautiful limestone lodge, and the large log cabins that are dormitories, people still come here to learn, Since Mr. Jensen's death, at the age of ninety-one, "The Clearing" has been operated by the Wisconsin Farm Bureau on a not-for-profit basis. It is used for adult education in many fields.

The 1957 schedule, for instance, included courses in Nature, the Middle East, conservation, poetry, government, "The American Wilderness and the American Dream," painting, writing, literature, land use, and arts and crafts. Experts come here to teach a limited enrollment. Courses usually last six days, with the exception of those in painting and writing, which last twice as long. Students are interested adults who wish to combine a vacation in a dramatic woodland and lake setting with a stimulating study that requires only a part of each day. The rest of the time is occupied in exploring the region, swimming, and other sports, and with a personal communion with the forest.

The date of the spring Nature course coincides with a great burst of bloom in Jens Jensen's woods. Here a group of yellow lady's slippers glow in the aspen grove.

For this was Jens Jensen's theory: Man, in order to know himself and to regain some of his own lost integrity, must first know Nature . . . he must look to the wild for truth and honesty, for substance, for courage, and for the assurance of the continuity of life . . . to understand the true meaning of a forest which has come back to a difficult terrain.

In all the courses, therefore, this underlying belief in the teaching of the woods itself is present. In the Nature courses, however, it is probably most deeply realized. In this field, classes are not begun nor ended at a specific hour, except for meals. For in May you cannot say, "I will now study trees, or mosses, or fossils, or the philosophy of the forest, and nothing else," when a wonderful surge of migration has filled the trees with warblers, tanagers, finches and thrushes up from the tropics. Nor can you assert, "Birds today!" when a northeaster is blowing cold rain on a punishing wind that whips the newly leafing aspens, and only the indomitable ovenbird is daring to sing, or a lone, fluffed-up downy woodpecker shows itself. The deer are hidden, the red squirrel is snugly put away, the porcupines are out of sight.

But you take the out-of-doors as it comes, and at "The Clearing" it is always there, always revealing something of itself, no matter what the weather or the time of year.

The date of the spring Nature course coincides with the great burst of bloom that is part of Jens Jensen's woods. They are dominated by thousands of great white trilliums, augmented with half a dozen kinds of violets, decorated with yellow adder's tongues and gemmed with dwarf ginseng and corydalis. Yellow lady's slippers bloom in the aspen grove.

Field trips are taken to the (*continued on page 52*)

Prairie Galls

By H. H. PITTMAN

Photograph by the Author

These galls, resembling a cluster of nuts, were found by the author on a poplar twig in a thicket in Saskatchewan, and are the work of the tiny, two-winged flies known as gall-midges.

GALLS of many shapes and sizes are common on the Canadian prairie, and most people are familiar with one or more forms. The cone-shaped growths, so often seen on the common sallow of the western plains, and the large globular swellings on the stems of goldenrod are probably the best known, but many others can be found on the leaves, branches and even roots of our wild plants. Most of them are caused by insect activity, and form the cradles or resting places of the larvae of a most interesting and puzzling group of tiny insects.

Usually the swellings and malformations are the result of irritation of the sensitive meristem tissues of plants, but whether this irritation is caused by the presence of the intruding eggs, or by the fluid introduced at the same time, seems to be uncertain. In any case, the plants apparently try to heal and cover up the injured spots with a great increase of tissue and material that presumably would normally be used in the formation of stems and leaves. As each kind of insect causes a gall of a certain type to be formed, even upon the same plant, an observer is inclined to believe that the different kinds of fluids produced by each insect may be the cause of the differences in the stimulated growth. It has even been suggested that synthetic products of a similar nature to these fluids might be of use to horticulturists.

The peculiar growths loosely grouped together under the name galls are due to the actions of wasps, midges, aphids, moths, beetles and even mites, those minute creatures apparently more closely related to spiders than to insects. They may contain a single larva, or forty or fifty, as is sometimes the case with the European insect known as *Rhodites rosae*, and they may be found on the flowers in the fields, wayside bushes and most kinds of trees. Recently, I noticed what appeared to be a cluster of nuts hanging from a poplar twig in a thicket in Saskatchewan, and found that it was the work of gall-midges—tiny two-winged flies resembling gnats, but smaller. They probably belonged to the order or family Cecidomyidae, but, as an attempt to rear the insects failed, the species could not be identified.

This family of little dipterous, or two-winged, flies is widely spread, but is seldom studied because the insects are so small that a microscope is needed. A lens shows most of them to be beautiful little creatures with long, necklace-like antennae, a wealth of minute hairs, long, slender legs and rather broad wings with curiously little veining in them. Greater magnification will show the peculiar structure of their compound eyes, and how each individual eye protrudes instead of being a flat facet, as is the case with most insects. The members of this family cause galls of many different types, for besides the nutlike ones shown in the photograph I have found cone-like clusters of green leaves made by *Cecidomyia taxi* on yew trees, and cottony galls made by *C. veronicae* on one of the early-blooming speedwells in the south of England.

More Amphibia

By E. LAURENCE PALMER

Illustrations of adults by C. M. Reilley Jr., and Hope Sawyer

This is the ninety-fourth of NATURE MAGAZINE'S *special educational inserts.*

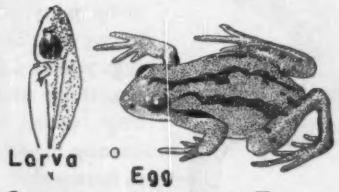
THE THIRTIETH in this series of inserts dealt with some common amphibia. Most of the species chosen were of wide-spread distribution, but emphasis was placed on species from the Northeast. The reaction to the insert on snakes was so encouraging that it seems best to give you another on the amphibia, which, like the snakes, are cold-blooded vertebrates. But this time we will be sure not to slight the South and the West. None of the eighteen species considered in this insert is included in insert thirty.

It may seem to some inappropriate that we suggest the study of amphibia in January, but in some parts of the country the breeding season for some of the amphibia will have passed by January, or be at its peak. And many of us, anxious for the spring, listen intently during a mild spell in midwinter for the sound of a peeper that suggests that spring may not be too far away.

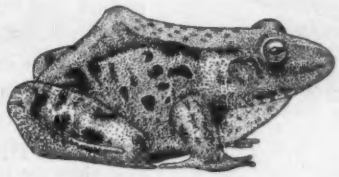
Since sounds are often the first evidence that the amphibia are with us, let us consider sounds first. When you hear a spring chorus of frog calls, you might well conclude that every amphibian that ever lived had been resurrected with the spring. This, of course, is far from the truth when we consider the facts.

There are two major groups of amphibia, the Caudata, or tailed, amphibia, which includes the newts and salamanders, and the Salientia, or tail-less amphibia, which includes the toads and frogs. Few, if any, of the Caudata make any sounds of consequence and what sounds there may be are not produced for effect, so far as is known. In the frog and toad group, we find that, while some females may produce some sounds, the major singers are the males. It is easier to say that the males produce sounds than it is to say why they do so. We know that, as with some birds, the first amphibia to arrive on a breeding ground are usually the males and that, if they are sound-producers, they begin to make themselves heard before the females show up. Whether they do this to call the females and let them know where their "boy friends" are, or whether the males are defying each other is difficult to prove. We do know that the calling increases in volume with the arrival of the females; that the temperature may have something to do with the frequency of the calls; that the frequency may also be an index of an approaching climax in mating.

Oregon Red-legged Frog



Swamp Cricket Frog

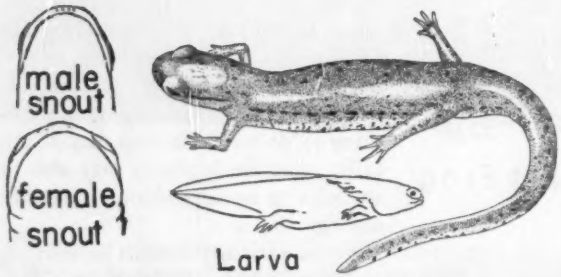

Gopher Frog

Green Tree-frog

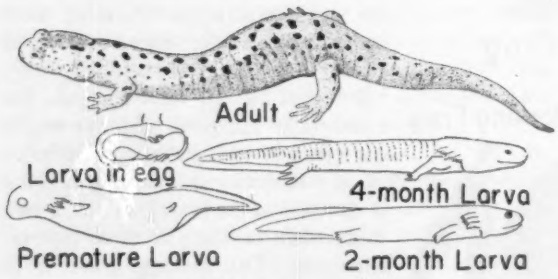
If you have any interest in learning to recognize the calls of the amphibia it may be worth your while to get a copy of "Voices of the Night," a long-playing record of the sounds produced by 34 different frogs. Nine of these are voices of the peeper-tree toad group; nine belong to the *Rana* group, represented by the bullfrogs; six are members of the genus *Bufo*, to which our common toad belongs. Listen to see if you cannot recognize something in common in the frogs that inflate two sacks when calling and those that inflate one. The bullfrog group is of the latter type. This record ($6.75) is procurable through *Nature Magazine*. It was prepared by Professor P. P. Kellogg of the Laboratory of Ornithology of Cornell University, working with Professor A. A. Allen, who also has prepared kodachrome slides of the animals involved. With the record, the slides, and Professor and Mrs. A. H. Wright's *Handbook of Frogs and Toads of the United States and Canada* you should be prepared to start a most intriguing hobby.

California Newt

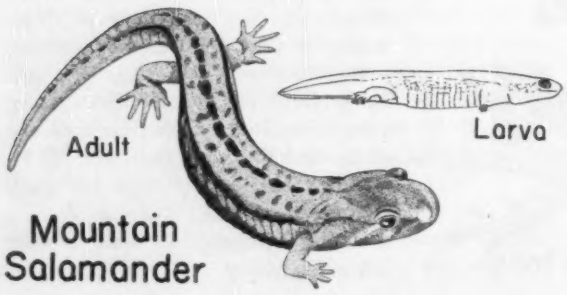
Worm Salamander



Four-toed Salamander



Red Salamander



Mountain Salamander

The Development of an Amphibian.

Zoology texts will give you the Amphibia. Here we wish to consider the variations to be expected in the different stages of their development. Roughly these stages are the egg, the larva, the immature individual that has passed the larval stage, and the mature adult.

Many of us welcome the spring season by taking a hike, usually along the edge of some waterway. There, in the water, we frequently see masses of jelly-like eggs, possibly of a frog, toad or salamander. The eggs laid early in the spring are usually well under water, below the point where newly forming ice may be destructive. Sometimes, to keep them submerged, the egg-masses are attached to something between the bottom and the surface. It might mean death by suffocation with silt to be at the bottom, and death by freezing at the top. The safest place under these circumstances is to be attached to some submerged stick or plant.

It may surprise you to know that most frogs, toads and salamanders may be identified by their eggs alone. The egg may be protected by a single covering of jelly, or by many, and the egg-mass may itself be surrounded by an envelope. Many of the newts will lay single eggs attached to some plant, and the peepers usually do something similar. Frogs, like the bullfrogs and green frogs, which breed late, usually lay their eggs in flat, floating masses that make the most of the warm water to hasten their development since these eggs are usually laid rather late in the season.

Some amphibia lay their eggs in moist places on the ground, and some even carry them around in special pits on their backs. Some salamanders carry the eggs around in a parent's mouth, thus assuring some degree of protection from enemies and preventing burial in silt. A few salamanders will even eat some of the eggs before they begin protecting them. This leads to the guess that they are protecting a choice bit of food rather than their young. With some species the mother provides the protection, and with others it is the father. In some cases, a number of mothers may protect the eggs laid by the lot, with the mothers taking turns in baby-sitting. Almost invariably it is essential that the egg of an amphibian must have moisture and be prevented from drying. This may be done by a parent "sitting on" the eggs, and this is a habit found both in salamanders and among the frogs and toads. In the case of the barking frog, shown in this insert, the moisture may in some cases come from the urine of the father, who provides protection for the eggs.

At first thought it seems impossible that some of these great masses of frog's eggs that we see could come from such small animals. If you watch the laying act, however, you will notice the great expansion in size that takes place as the eggs take up water on leaving the body of the mother.

Some amphibian eggs are remarkable because of the fact that they serve as the stage in which the larva gets its development. When such eggs hatch, a little frog or salamander comes into the world, and is shaped

much like the adults that were responsible for its existence. Amphibia that lay such eggs usually lay relatively few and relatively large eggs. These eggs, too, usually get a degree of parental care.

The number of eggs laid by amphibia varies greatly. One kind of frog lays only a single egg in a season, while a large toad found in southern United States may lay as many as 32,000 eggs at a time. Obviously this toad could survive if many of its young did not reach maturity, and a few generations without loss would populate the whole world.

The Larval Stage. The larval stage of frogs and salamanders is most commonly characterized by the presence of external gills, although this is not always the case. In some cases, these gills remain in evidence for a short time; in others the gills may remain as external structures through the adult life of the animal.

The larval stage is the period in which the main task is to increase the volume of the individual. It is probably the period of most rapid growth. The length of time from the egg-laying to the end of the larval stage may vary from a month, in animals such as the spadefoot toads, to a year or more, as in bullfrogs and some of their kin. Of course, we speak of the larvae of frogs and toads as tadpoles. It is during this stage that a change may be made from using gills to carry on respiration to the use of lungs. This change-over may be critical in the life of the individual. Only yesterday a friend called to want to know what was the matter with a tadpole she had kept comfortably in an aquarium for most of the summer. The animal seemed to want to get out. Of course, it was probably changing from the gill to the lung stage, and if it could not get out of the water it would drown.

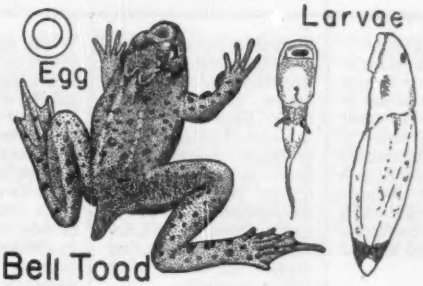
It is a common thing among amphibia to find in the larval stage the change-over from a life

Green Salamander

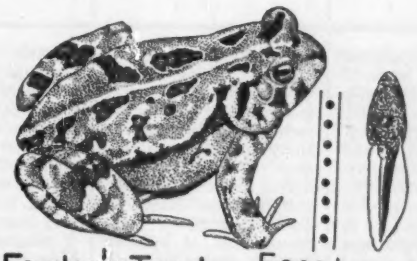
Purple Salamander

Siren

Spadefoot Toad



Bell Toad



Fowler's Toad Eggs Larva

in the water to a life on land and the development of legs, which are more suited to a terrestrial life. With the change-over, too, the tail, which was most valuable for a life in the water, may be absorbed into the body. It is not shed, as some traditions hold.

When the transition from aquatic to terrestrial life begins many frogs may come out on the land with remnants of the tail still visible. In the relatively primitive bell toad, pictured here, it seems as though the tail persists through the adult life. As a matter of fact, the tail of this frog serves as an organ of reproduction and assists in the internal fertilization, which occurs with these animals. One interesting thing about this group is the fact that our bell toads are limited to our Northwest, and the only other group is to be found in far off New Zealand. This group represents the only native amphibians in New Zealand. Probably these animals are the remnants of populations that once had a much wider distribution.

The Post-larval Stage. Once an amphibian has developed sufficient size to transform to its adult way of life it is not necessarily a mature animal. As a matter of fact it may be years before a little toad or frog may be ready to mate and lay eggs. Relatively little is known about this period in the life of most of our common amphibia. This presents an opportunity for research that some may wish to investigate.

In our newts we have what is called the eft stage, which is a period in which the animals come out on land and live a normal life there. Then, when they become sexually mature, they may return to the water where they spent an early larval stage. They do not change back and forth from these stages, and the land eft form is just a stage on the way to the sexually mature adult. Much confusion has arisen in

(*Continued on page* 32)

COMMON NAME SCIENTIFIC NAME	SNAKE EEL CONGO EEL Two-toed (1); Three-toed (2) *Amphiuma means (1);* *A. tridactylum (2)*	CALIFORNIA NEWT *Triturus (Taricha)* *torosus (a)*	MOUNTAIN SALAMANDER *Desmognathus* *ochrophaeus*	FOUR-TOED SALAMANDER *Hemidactylium scutatum*
DESCRIPTION	Length, (1) 35 inches; (2) 40 inches. Toes on each foot normally, (1) 2; (2) 3. Color change from top to bottom, (1) indistinct; (2) sharply defined. Grooves on side, (1) 57-60; (2) 60-64. Brown above and lighter beneath. Vent of male bordered by ridge; of female a simple slit. Little age variation other than size.	Length, males to 7¼ inches; females to 7 inches. Tan to red-brown above and pale yellow to orange beneath. Eyes yellow to greenish-silver. Horizontal black bar across pupil. Lateral walls of cloaca of male with pimples; of female with simple folds. Otherwise sexes superficially alike most of time.	Length, males to 3¾ and females to 3½ inches. Slender. Tail circular in cross-section and normally with no dorsal crest. Costal grooves, 14. Legs moderate. Males with pimpled vent and pointed lower jaw. Usually with broad, straight-edged light band down back, sometimes with medial row of round dark spots.	Length, males to over 3 inches; females to 3-2/3 inches. Tail with constriction at base. Belly white, flecked with black spots, nearly cylindrical. Head somewhat flattened. 13-14 costal grooves, and a well-formed fold at throat. Upper surface bronze or reddish-brown. Toes 4. Upper front teeth of male may pierce lip as shown.
RANGE AND RELATIONSHIP	Order Caudata. Family Amphiumidae. Body cylindrical. Eyelids absent. Adults with lungs, gills and gill slits. Ranges (1) along coast from southern Virginia to Louisiana and inland for about 100 miles; (2) from southern Georgia along coast to Louisiana and up Mississippi River to Ohio River. Within 100 miles of coast or river.	Order Caudata. Family Salamandridae. See vermilion-spotted newt, Insert #30. Sometimes known as giant newt. Seven newts in United States; 8 kinds in Europe. Only British salamanders are newts. Three are known from Africa. *T. torosus* found along California coast from Los Angeles to near Oregon border.	Order Caudata. Family Plethodontidae. See dusky salamander, *D. fuscus*, Insert #30. This species ranges through Appalachian Highlands from Catskill and Adirondacks in New York to mountains of northern Georgia. Found in two varieties, the Allegheny and the Carolina mountain salamanders.	Order Caudata. Family Plethodontidae. Includes worm, purple and mountain salamanders of this insert and two-lined, slimy, dusky and red-backed of Insert #30. Four-toed found from Michigan to northeast Arkansas and east to Atlantic coast but only in isolated areas in Maine, Alabama, Georgia and South Carolina.
REPRODUCTION	Nest in a hole under ground where it is wet, often in a crayfish burrow. To 150 eggs, 1/3-inch in diameter, in a string but bunched into a ball, laid in June or thereabouts and attended by female until hatching. Gilled larvae are to 2½ inches long at hatching and may transform into adult form at 3 inches in length. Nests found until October.	At breeding time, December to May, males congregate first, assume smooth skins, finned tails and enlarged cloacas. Court females en masse on arrival and violently. After courtship male places jelly spermatophore on bottom from which female takes the sperm. Eggs laid in water singly or clustered. Incubation to 52 days.	Mate mostly in summer or fall, but there is a spring activity. Eggs are found from August through October and young are found through autumn and in March. Courtship of male followed by laying of white, sperm-tipped spermatophore, which is taken up by female. Eggs, white, 1/6-inch in diameter, attached to stalk in clusters.	Mates from late summer through the fall. Males court females, lay spermatophores, which fertilize females. Eggs laid near water or moisture with clutch of 30 eggs found together but not enclosed in envelope. Female remains with eggs until they hatch. Eggs to 1/5-inch in diameter. Incubation 40-60 days.
ECOLOGY	Habitat is for (1) muddy pools, swamps, sloughs and ditches or water margins where water is still; for (2) is open streams where water is flowing and commonly where water has flowed over limestone. Food is small aquatic life such as crayfish, mollusks, small fishes and similar animals.	Females leave water after breeding but males stay in water some time before assuming land form. Eggs usually laid in water 6 inches or more in depth. Larvae grow from ½ to 2½ inches during period prior to transformation. Food is snails, slugs, worms, insects, fish eggs, decaying organic material. May rest in summer.	When eggs hatch they yield ¾-inch larvae, which bear short white gills briefly. These salamanders may be found a rather considerable distance from water, hiding under trash where there is some moisture. Eggs are cared for by female, who takes them to areas of suitable moisture up or down as case demands.	On hatching, larvae are well developed and to ½-inch long. Gills are slender with orange and black. Aquatic larval stage lasts about 6 weeks, followed by terrestrial larval stage beginning at 1 inch length and lasting to 2½ years before sexual maturity is reached. Found usually near woodlands where there is moisture.
ECONOMY	Gill slits are retained after the lungs begin to function and the gills are no longer used. Congo eels are not considered as being of any major economic importance, but are interesting as representing amphibia that live on land, or in water where land and water meet. Of special interest to zoologists.	On occasion may be destructive of fish nests but usually are of value in controlling aquatic insects such as mosquitoes. Body may be colder than the environment during the summer aestivation period. Range of California newt may match that of interior live oak, digger pine and yellow pine in Upper Sonoran life zones.	Of little economic importance probably. Food is largely small animals found in habitat. Related species known to have served as reservoirs that pollute drinking water with colon bacilli, but this is probably true of other species of salamanders as well. May destroy some unwanted aquatic insects and slugs.	Of little known economic importance but food is mostly insects, spiders, worms and other small animals common to its habitat. Possibly has some food value to enemies, but it is doubtful if it ever plays an important part in the economy of its environment.

WORM SALAMANDER *Batrachoseps attenuatus*	GREEN SALAMANDER BRONZED SALAMANDER *Aneides aeneus*	PURPLE SALAMANDER *Gyrinophilus porphyriticus*	RED SALAMANDER *Pseudotriton ruber*	DWARF SIREN *Siren intermedia*
Length to 5¾ inches but averages nearer 4 inches. Tail about ½ total length. Legs short and weak. Toes 4 on each foot, short and ball-tipped. Costal grooves about 20. Whole animal slender. With brownish-red, broad dorsal band defined on either side by narrow darker line. May be greenish-yellow beneath.	Length to 5 inches with males slightly larger than females. Black with yellowish-green, irregular spots and with toe tips expanded. Eyes are large and protruding. Head may be slightly swollen behind eyes in males. Pupil horizontally elliptic. Costal grooves 14. Toes 5 and 4. Legs strong and active.	Length to 8½ inches with females somewhat smaller. No constriction at base of tail. Costal grooves 17 or 18. Legs strong and stout. Toes 5 and 4. Tail rounded on sides and flattened below or rounded and compressed above. Light yellow-brown tinged with red and *not* purple. Shows dark network.	Length to 6½ inches. Females are usually longer than the males. No black-bordered groove from nostril to eye. Head widest just behind eyes. 16 costal grooves. Poorly defined groove behind eye. Legs short and stout. Toes 5 and 4, short. Tail tip compressed. Coral red with flesh color on lower sides and beneath. Black dotted.	Length to 13½ inches of which about 1/7th is head. No hind legs. Related giant siren, *S. lacertina*, is to 3 feet long. Three pairs of gill slits. Toes 4 to a foot. No eyelids or cloacal glands. Mouth small. Nostril small slits. Gills rather bushy. Costal grooves 30-34. Tail compressed towards tip.
Order Caudata. Family Plethodontidae. See previous columns. Found along Pacific Coast from central Oregon to just south of Mexican border but not to central north-south line in California. Represented by at least 5 subspecies, of which *B. a. attenuatus* occupies almost all of the territory to exclusion of others.	Order Caudata. Family Plethodontidae. See preceding columns. This species found in Appalachian highlands of West Virginia, Ohio, Kentucky, Tennessee, Georgia, Alabama and the Carolina-Virginia area. At least four other species limited to west coast of California, Oregon, Washington and southern British Columbia.	Order Caudata. Family Plethodontidae. See preceding columns. Five varieties range from most of New England to Georgia and Alabama, with *G. p. porphyriticus* occupying most of territory and others in only limited areas. Generally confined to northern Appalachian highlands. Found into Canada, in southern Ontario.	Order Caudata. Family Plethodontidae. See previous columns. From southern New York and lower Hudson Valley south along the highlands to Gulf Coast of northwest Florida to Louisiana, but not on coastal plain along the Atlantic south to central New Jersey. Of 4 varieties *P. r. ruber* occupies almost all of north central range.	Order Caudata. Family Sirenidae. *Siren* has 4 toes, 3 pairs of gill slits and reaches length of 3 feet. *Pseudobranchus* has 3 toes, 1 pair of gill slits and a length of 8¼ inches. Siren has 2 species, with *S. intermedia* in 2 varieties along coast from S. Carolina to Mexico, except southern Florida and up Mississippi River to Chicago.
Males have broader blunter snouts than females and shorter vent opening with front margin raised. Females lay to 15 or more eggs, often in common nest. Eggs 1/6-inch in diameter, uncolored, with 3 jelly envelopes. Eggs laid November to March, attached in bead-like strings; hatch mostly in spring.	Little, if anything, known of breeding habits of this species. Eggs have been found in July and August, are yellowish, attached by short cords, are to 1/5-inch in diameter, are buried in rotting wood and are commonly accompanied by the mother. Young have been found numbering to 17, to 1 inch long and with mother present.	Little known about breeding habits but breeding probably centers from June to November. Eggs have been found in females from April through November. Eggs may number to over 130, are to 1/8-inch in diameter, are attached to a support in water on a lower surface. Larvae to 1 inch long in April to July.	Breeding begins with falling temperature. Eggs to over 70 in a group are colorless, borne in small clusters but attached separately often with eggs of more than one female together. Eggs are to ¼-inch in diameter, including envelope. Larvae at hatching time are to ½-inch long but develop to length 4¼ inches.	Nothing known about breeding of *S. intermedia intermedia* but *S. intermedia nettingi*, the southwestern variety, probably breeds in April. One clutch of 555 eggs reported from a hole in a pool bottom each egg being to 1/8-inch diameter with 3 envelopes. Larvae at hatching are to ½-inch long, ½ length being tail.
Newly hatched larva may be 4/5-inch long, black with brown tinge with silvery white patches beneath. Worm salamanders are found in holes in trees, in cellars, sewers and ditches. May burrow deeply in dry weather, coming to the surface in numbers with the arrival of a rainy season.	These salamanders may be very active and may leap to 3 times their total length. This species haunts crevices in cliffs or space under loose stones, logs or pieces of bark where it is either dry or damp. May not be easy to catch unless searcher is alert as cover is opened.	This species is found in springs and swift, cool waterways, or in spring-fed, swampy lands. It is believed that the larval period lasts to 3 years and that the transformation into the adult sexually mature stage takes place with larvae to 5½ inches long.	Live in cold streams or brooks, or in fields near them, but in summer adults may take to the land and go considerable distance from the water, hiding under stones, boards and trash. Breeding is definitely induced by falling temperature, which brings animals back to the water.	Life history is only poorly known, and data regarding it would be welcome by almost any biologist. Sirens, large or small, are found in a variety of waters. Some large ones capable of going over 18-inch dam with ease. Related mud-siren, *Pseudobranchus*, in 2 varieties found in South Carolina, Georgia and Florida.
Relatively little is known of the breeding habits of most of the subspecies or varieties of this salamander, and the economic importance, if anything, is probably negligible. May feed on harmful invertebrates that burrow in the trash in which they themselves live.	Probably of little or no economic importance. Interesting in part because we know so little about the animals, and therefore what we observe may be relatively new to science and to general information.	There is a possibility, and a probability, that these salamanders may be seriously destructive to trout eggs in hatcheries or in waters that support trout naturally, since they feed and live in areas similar to those chosen by trout for their nests.	Probably of little or no economic importance. Their food, like that of their close relatives, is largely small animals of their habitat, including insects, slugs, worms, spiders and the like.	Probably of little economic importance, although they might be destructive to fish nests and to schools of little fishes. Any information relative to habits would usually be worth while, so watch for breeding animals, feeding animals and evidence of predation by other animals.

COMMON NAME SCIENTIFIC NAME	AMERICAN BELL TOAD AMERICAN RIBBED TOAD *Ascaphus truei*	SPADEFOOT, HERMIT OR STORM TOAD *Scaphiopus holbrookii*	FOWLER'S TOAD *Bufo woodhousii*	SWAMP CRICKET FROG HAY FROG *Pseudacris nigrita*
DESCRIPTION	Length, to 2 inches for females; to 1-7/8 inches for males. Adults with short tails. Tails involved in reproduction. Like a brown, pink or gray to black tree-toad. With well-developed glands on head. Under side of legs rose-colored. Toes without webbing. Skin smooth to rough. No visible external ears. No vocal sac.	Length to nearly 3 inches. Resembles common toad, with small round glands behind ears. Skin smooth with scattered warts; may be yellowish in males and brownish in females. Often with obscure lighter longitudinal stripe down back. Horny structure on inner sole of hind foot helps in digging and gives toad its name.	Length to 3¼ inches with the female the larger and the lighter colored. Female light grayish-olive; male, greenish with yellow-brown mid-stripe and dark spots on back. Several small, round warts to a spot, as contrasted with 1 or 2 to a spot in American toad (See insert #30). Warts uniform in size. Unspotted below usually.	Subspecies *triseriata* is to 1½ inches long with female the larger. Slender. Skin finely granular. Fourth toe exceptionally long. Toes ending in disks. Olive-brown or gray with dark spot between the eyes and three irregular longitudinal stripes down back, well-defined but of irregular pattern.
RANGE AND RELATIONSHIP	Order Salientia. Family Ascaphidae. One genus and 1 species in the family, which is primitive. Found from extreme northwest California through western Oregon and western and northern Washington and in southern British Columbia, northern Idaho and extreme northwestern Montana and northeastern tip of Oregon.	Order Salientia. Family Scaphopodidae. From New England to Oklahoma south through eastern Texas to Mexican border and east to Atlantic and southern Florida, except in higher areas. Two subspecies in *S. holbrookii*. In West represented by 3 subspecies of *S. hammondii*, and in Southwest by 1 of *S. couchii*.	Order Salientia. Family Bufonidae. About 17 species in genus in U.S. Two subspecies. *B.w. woodhousii* in Great Plains and mountains east of California to Washington and west of Louisiana to Minnesota. *B.w. fowleri* north of line from Galveston to mouth of Chesapeake Bay, on to Maine, west to s.e. Iowa and s. to Galveston.	Order Salientia. Family Hylidae. Family represented here by swamp, cricket and green tree frogs and in insert #30 by peeper and tree and cricket frogs. Six subspecies of *P. nigrita* east of Rockies from Mexico to Arctic Circle and east to Florida and New England. Not widespread in eastern Canada or Appalachians.
REPRODUCTION	Breeds May to September. Eggs laid in masses of strings fastened to underside of stones in swift cool water. Eggs 28-50, uncolored, to 1/3-inch in diameter. Tadpole to 2¼ inches long with sucker around mouth, long-tailed and stout-bodied. May develop over winter to transform July-September to ¾-inch frog. Tadpole tail-tip white.	Breeds after heavy rains or floods. Males call "wank" from underground or above sounding like young crows, repeating in 2 seconds. Breeds March-September. Eggs in irregular bands laid on vegetation under water, hatch in 2 days. Tadpole bronze, to 1-1/8-inch long, transforming July to September after 2-8 weeks at ½-inch size.	Breeds later than common toad from April through August. Male's call a buzzing scream for 2 sec. repeated at 10 sec. Eggs laid in long jelly strings at first in double row totalling to 8000. Tadpole has low tail crest, is to just over 1 inch long and transforms from June to August after 40-60 days to ½-inch toad.	Breeds March to May in central territory. Eggs in masses of to 100. Female may lay 1500 singly, brown or black and white, to 1/20-inch through, with single envelope. Tadpole may be to 1 inch long with long tail, black with bronze on sides and belly, transforms after 40-90 days development into little frog to ½-inch long.
ECOLOGY	Food of tadpole largely algae grazed from surface of submerged stones in swift water; of adults mostly insects and other small animals. Having no vocal sac can make no noise. Frogs appear often like brown chips of wood or bark that float away in stream when disturbed.	Nocturnal in behavior and definitely associated with presence of water. May appear in great abundance for a day or so and apparently nonexistent much of the rest of the year. May be found resting at burrow entrance. Food like that of common toad, largely insects, worms and other small animals.	Call of male is found on record "Voices of the Night" available through *Nature Magazine*. The call lacks the musical quality of that of the better known common toad. Food like that of other toads is largely insects, earthworms and other small, live animals captured by lightning-like thrust of tongue.	Call a vibrating chirp on record "Voices of the Night" and capable of being heard at distance of ½ mile when it is quiet otherwise. This is a tree frog that is rarely if ever found in trees. It lives on ground among low plants or under trash and is often active at haying time in hayfields, getting the name hay-frog for this.
ECONOMY	Of little or no economic importance but most interesting because of apparent retention of tail into adulthood. The single sucking disc on head of larva on the middle of under side is considered a primitive character. The "tail" is considered by some from an evolutionary standpoint to be forerunner of penis of higher animals.	Unquestionably useful as destroyer of some pests. Does not give warts. Not in same family as common toad, which was developed in insert #30. Song recorded as #11 in Part 3 of "Voices of the Night" along with 33 other species. For sale through *Nature Magazine*.	Useful as destroyer of many animals that are pests of garden plants, and while this species favors sandy beaches, shores and river banks, it is nevertheless found in gardens and cultivated fields where man raises his garden and other crops.	It is entirely useful, no doubt feeding on insects and other small animals of its habitat. It is preyed upon heavily by snakes and other predators that share its environment. May make reasonably good terrarium animal and may call in classrooms if confined. May cause surprise to one sitting quietly in field where they are active.

GREEN TREE FROG BELL FROG COWBELL FROG *Hyla cinerea*	BARKING FROG *Eleutherodactylus latrans*	RED-LEGGED FROG *Rana aurora*	GOPHER FROG *Rana capito*	MINK FROG *Rana septentrionalis*
Length to 2½ inches, with female slightly the larger. Long-legged with sticky pads on toe tips. Skin smooth and bright green with light side-stripes or with gold or silver side band separating green of back and yellow or white beneath. Throat green. May have to 20 orange spots on the back.	Length to 3 inches. Relatively easily distinguished by circular fold of skin on belly, which makes a good-sized disk. Head is broad with a fold of skin behind the eyes. "Ears" are about ½ the size of the eyes. Under side is yellow. Limbs are banded in dark brown. Toes are free from any webbing.	Length to over 5 inches. Somewhat suggestive of wood frog, Insert #30. Skin smooth or finely pebbled. "Ear" 2/3 size of eye. Black or brown eye mask poorly defined. Limbs barred or blotched with black. Groin black or yellow or greenish. Light beneath but rear of under side and under side of hind legs is usually red.	Length to 4-1/3 inches with female the larger. General appearance that of a gray, heavy, broad, slender-waisted frog, with large mouth and conspicuous eyes. Gray is flecked with black dots and there are 3-4 dark, irregular spots on back. Limbs conspicuously barred and under legs dark mottled. No or little yellow on female.	Length to 3 inches, with females slightly the larger. Resembles green frog (See insert #30) but may lack the folds on the back that give that frog one of its easiest field characters. Males have lateral external vocal sacs somewhat developed while green frog has no such development.
Order Salientia. Family Hylidae. This species in 2 subspecies ranges from Delaware to southern Texas along the coast to 150 miles inland but up the Mississippi River to St. Louis. In this range, *H. c. evittata* is found north of North Carolina and *H. c. cinerea* is found in the remainder of the range.	Order Salientia. Family Leptodactylidae. Family, known as robber frogs, includes 3 genera, *Eleutherodactylus, Leptodactylus* and *Syrrhophus*. Genus includes 2 species in U. S., *latrans* and *ricordii*, with *latrans* ranging from north central Texas to southeast Arizona and south into Mexico.	Order Salientia. Family Ranidae. Family includes bull, green, wood, pickerel and leopard frogs of insert #30 and mink, gopher and red-legged frogs of this unit. *R. aurora*, in 2 subspecies, ranges from southern British Columbia through central and north central Oregon to northern Mexico discontinuously but near coast in south.	Order Salientia. Family Ranidae. See preceding column. This species ranges from eastern North Carolina south relatively near the coast to central Florida but is excluded from extreme southern Florida and extreme western Florida. There are no recognized subspecies.	Order Salientia. Family Ranidae. There are no subspecies. The species ranges through southeastern Canada and northeastern United States north to mouth of St. Lawrence near Gaspe, west to southern border of Hudson Bay and south into eastern Minnesota, Wisconsin, northern Michigan, northern New York and New England.
Breeds in water April to August after males call. Eggs black or brown and white or cream, in bunches or films, to 1/16-inch in diameter, within envelope to 1/6-inch. Tadpole to 1-3/5-inch long, with green body and yellow or gold stripe on side of head. Larval period lasts 8 to 9 weeks and transformed frog is at first ¾-inch long.	Little known of breeding but season is from February through May, with female laying as many as 67 eggs each to 1/3-inch through, in rain-filled crevices in rocks, and while its story is not well known it is believed that moisture is supplied by urine of male and that tadpole stage in the egg lasts about 5 weeks.	Breeding takes place in February to May but locally is of short duration. The eggs are deposited in masses, are individually to 1/8-inch in diameter, with ½-inch loose, sticky, jelly envelope. Tadpoles reach a length of ¾ inch in 11 to 12 weeks and transform into frogs, which become sexually mature in 3-4 years.	Breeds through the year. Eggs laid in a flattish mass to 8 inches across and to 1½ inch deep. Each egg with envelope to 1/5-inch in diameter. Eggs hatch in 4½ days and tadpoles develop into animals to 3½ inches long, with substantial bodies and long tails and at end of 3 to 4 months transform into 1½ inch frogs.	Breeds from late June to middle of August, the eggs being in a floating mass to 5 inches long and to 2 inches deep. Egg is brown to black or yellow, with development becoming nearly ½-inch through. Tadpole is olive, to 4 inches long, with long acute tip developing through a year and transforming to 1½-inch frog.
May call at rate of 75 times a minute giving a rolling croak which is recorded in "Voices of the Night" available through *Nature Magazine*. May spend most of life in trees well above ground and perfectly camouflaged by coloration. On ground may hide under trash and be hard to find there, of course.	Known to eat beetles, ants and spiders and probably feeds on many other animals. Is probably almost strictly nocturnal and so not easily collected, particularly as they may remain attached to smooth-barked trees whose color they resemble closely. Calls like a rapidly yapping fox, mostly at night in rain.	These frogs have been known to live in captivity to about 15 years. They feed on insects and other small animal forms to be found in their environment, are beautifully camouflaged to match their environment but make up a part of the diet of many larger predators. Call lasts about 5 seconds and interpreted as "r-r-r-r-owr."	Call is recorded in "Voices of the Night" and is described as a cross between a snore and a groan, sounding like a deep hollow roll. Call is accompanied by inflation of lateral pouch to nearly size of frog's head. It may last 1-2 seconds and be repeated at 2-3 second intervals.	Call like that produced by driving large nail into heavy board is recorded in "Voices of the Night" and of course is given by the males only. Like their kin these frogs feed on insects and other small animals of their environment and provide good food for their many enemies.
Since food is largely insects that may well feed in trees, the frog can be considered as being beneficial. It also supplies some food to its enemies. May be kept with some success in greenhouses or on plants in screened porches where humidity is appropriate to their needs. May also do well in terraria if food is available.	Of little or no economic importance. The term "barking frog" is not limited to this species but is also applied to *Hyla gratiosa* in "Voices of the Night." *H. gratiosa* ranges from eastern North Carolina to eastern Louisiana and north central Florida.	Probably of little economic importance, but may be considered beautiful. Two subspecies include *R.a. aurora* of British Columbia, Washington and Oregon, and *R.a. draytonii* of remainder of range described above. Submits to confinement rather well and so is often in terraria, at least temporarily.	This species lives usually in burrows of gopher turtle, which are to be found in sandy hills and pine barrens. It may be seen in burrow entrance on dark days but is mostly nocturnal. It is probably of little or no economic importance but is of considerable scientific interest.	Hardly of major importance to man, but make excellent food for bass and may be used as bait. The legs may be eaten but do not have size of bull frogs and green frogs that share the same territory.

(*Continued from page 27*)

books about this stage because many observers have failed to note that the story that may be true in one place is not necessarily the true picture in another. What causes these variations I cannot tell you. It may be nutrition, seasonal variation, or what not. Why not try to find out what the story is where you live!

Mink Frog

The Adult Amphibian. For our purposes we should recognize that adult amphibians are either males or females. The sexes come together, mate and start a new generation. During this critical period the character of the animals may change radically. They may come into the open freely. They may make noises that may be heard a mile or more away. They may lose interest in eating. They may live in an entirely different habitat. These generalizations, of course, are not limited to amphibia. They are applicable to other animal groups. As in other groups, there is competition for mates at times, but monogamy, such as is the practice in many higher organisms, does not seem to have entered the schedule that is followed by the amphibia, although, as already suggested, there are cases where the male takes over responsibility for his offspring. Sometimes this arrangement apparently is voluntary, while at other times circumstances dictate what is done.

The food of adult amphibia commonly differs considerably from the food of the earlier stages. Tadpoles, for the most part, may live on oozes and slimes found under water. To harvest this food, the tadpole has appropriate lips, and each tadpole species has its own lip pattern. Upon reaching of the adult stage, or the stage after the first aquatic stage in newts, the food sought is more likely to be living animal matter, which must be captured by stalking or surprise. This puts a new responsibility on the animal and thus changes its habits.

The Ecology of the Amphibia. A glance at the life history material given on the 36 species dealt with in this insert and No. 30 shows that the animals, in one stage or another, live in a great variety of places. Go to the tree tops and you will find tree toads. Look on the tree trunks and you may find tree toads or barking frogs. Your garden may support toads and your fields of cultivated crops may yield meadow frogs, toads and possibly some of the woodfrog group. These habitats may have salamander representatives, with worm salamanders hiding and living in tree cavities, with spotted salamanders roaming our meadows and with efts feeding on insects in our gardens, if the weather is right. Woodlands have their own amphibian fauna, too.

When we reach the wetter spots we find water margins favoring pickerel frogs. The ditches provide breeding grounds for a great majority of the amphibia and even the depths and margins of pools may have different amphibians living in them. Even swift waters vary in their amphibian populations, with possibly the extreme being represented by the bell toads, which can cling as adults or larvae to the bottoms of swiftly flowing streams, or even in waterfalls. All of this information may well increase our interest in the group.

Of course, there are practical-minded folk who ask what good these animals may be. Many of the amphibia are edible by man, and some of them are capable of causing disturbances to the animals that feed upon them. The giant toad, *Bufo marinus*, may give off substances that are reputed to kill dogs that bite them, and many persons still believe that toads can give warts. It is true that some of the substances given off by either salamanders, or toads and frogs, can cause blindness in animals that get these substances in their eyes. This may be done if the eyes are rubbed after the amphibia have been handled. Usually this blindness, of course, is temporary, but in any case it is not pleasant.

As suggested in the chart section, a number of the salamanders that live in streams serve as reservoirs for undesirable colon bacilli, which may have been in insects on which the salamanders fed.

One of our frogs has found some use in laboratories interested in studies to make an early determination of pregnancy in human beings. Of course, a major use to man of some of these animals lies in their value in understanding the anatomy of animals. A considerable trade rests on the use of prepared frogs and salamanders in zoological laboratories. Sometimes these animals are of major value in this connection because their bodies represent simpler types of animal anatomy and may therefore be of greater value for instruction purposes.

Some thirty years ago my wife and I visited at the home of David Starr Jordan, the author of the classic *Manual of Vertebrates*, and who, following his graduation at Cornell, attended the famous school conducted by Louis Agassiz on the island of Penikese. He probably knew more in his life about the classification of vertebrates than any man I have ever known. I wanted a motion picture of this leader and sought to put something in his hands for a "close-up." I reached over to a nearby shrub in his home garden and handed him a small tree toad that was resting there. Jordan took it, looked it over carefully, passed it from one hand to another and said, "I wish I knew what species it is." Since that time I have never been too disturbed if I, a much less-trained man, did not know the species of every plant and animal I found on a trip. I mention this because Jordan was holding a frog that represents a relatively small group of animals. In spite of his failure to make a detailed identification, we continued to talk about that tree-toad and to enjoy it in many ways. I hope that you have the same sort of experience with some of the animals belonging to the amphibia. Wherever you live, they may come into your life.

Billboard Boys "Running Scared"

An Editorial

THERE is a phrase, "running scared," often used in political circles. It means that the candidate or the party doubt their popularity with the electorate and are overlooking no bets that will help them to win.

That the outdoor advertising industry is "running scared" is indicated in the report of the mid-November meeting of the Outdoor Advertising Association of America in New Orleans. *Advertising Age*, reporting on this meeting of the industry's trade association, says that the industry "is pulling out all the stops in its battle for survival."

According to the story from New Orleans, the industry adopted a "new and stronger revised code of practices for standard outdoor advertising," and put its okeh on a public relations program "to cost about $300,000."

We have not seen the "stronger code," but the trade journal of the advertising business says that the code provides that "outdoor operators will build displays in rural areas along highways only *where other business exists or is permitted.*" The italics are ours and are used because they emphasize the perennial joker in outdoor's "codes." Unless a site is specifically zoned against business it is fair game. *Advertising Age* observes that the new code "presumably would ban any outdoor signs on the new interstate highway system, except in areas that are zoned for business by state or local governments." This is a presumption that certainly cannot be based upon past performances, and effective zoning has lagged seriously.

Especially interesting is the advertising weekly's summary of the public relations program outlined for the industry by its public relations agency. This would be a "crash program," a relatively new phrase in advertising vernacular, meaning, we gather, that it will crash through every opposition with brainwashing techniques.

A lobbyist would be hired "to contact members of Congress and present the outdoor industry's story." There is nothing reprehensible about lobbying, and it is certainly the industry's right, but this item emphasizes the importance of telling the other side of the story—and there *are* two sides.

An experienced individual would be retained to coordinate the outdoor industry's activities with "other segments of the advertising field." This is an obvious attempt to convince all media that they are being attacked, ignoring the fact that opposition to the billboard arises from its special kind of offensiveness when improperly placed, and the roughshod tactics of the industry in the past.

Another part of the public relations program would be to employ an experienced highway engineer "to contact and talk to state highway officials." This recognizes the fact that more and more state highway officials realize the deteriorating effect of outdoor advertising on the highways they have built, and have a growing conviction that control is necessary.

Another member of the "crash" staff would be hired to contact public service groups. It was pointed out to the meeting that "these groups, which receive much free board space yearly, could be good friends and supporters of the outdoor field if they knew all the facts." This is, of course, merely the often-used device of pulling the strings attached to free space donated by the industry "in the public service."

Still another item is the employment of two women to contact women's organizations. This is in recognition of the widespread opposition to the rural billboard among such powerful groups. Beware, ladies, of charming Greeks bearing gifts of glibness.

In connection with the relationship of outdoor advertising to safety of travel at high speeds, the industry will finance a three-year traffic study of this relationship. No industry-financed study will ever prove the real facts; it is just not in the nature of man to bite the hand that feeds him. The only way in which the safety question—and it is a vital one—will be resolved is through an *impartial* study by highway and traffic experts, preferably with funds now available to the Federal Bureau of Public Roads.

The OAAA reaffirmed its opposition to any federal control and its insistence that it is willing to be governed by State and local regulations. This is, of course, smart tactics on the industry's part. Its success in preventing local and State control has been amply demonstrated in the past. The industry is deeply fearful of any federal legislation for control of outdoor advertising.

The meeting in New Orleans was addressed by Senator Robert S. Kerr, member of the Senate Committee on Public Works and consistent and outspoken opponent of any regulation of outdoor advertising. *Advertising Age* quotes the Senator as saying: "The purpose of advertising is to build good will. Some people don't seem to know that you can't afford to alienate the public's taste." The odd thing about this statement is that Senator Kerr is solidly in the outdoor industry's camp, yet he gives birth to two sentences that point up the fact that the industry's practices in the past have accumulated the ill-will that now demands reform.

Yes, the outdoor advertising industry is "running scared"—and none too soon. It has yet, however, to prove the sincerity of the high-sounding phrases to which it subscribes, so far tongue in cheek.

Big City Sanctuary

With binocular and telescope, bird watchers scan the marshes of the Jamaica Bay Wildlife Sanctuary for the birds that are returning to this redeemed area in increasing numbers.

Paul Buckley, center, and Peter Post, left, search the waters of Jamaica Bay with their telescopes. Both are members of the Linnaean Society, and Mr. Buckley plans a professional career in ornithology.

A NEW YORK subway train, like some burrowing animal, crawls up from underneath the ground and scurries over the trestle that stretches across Jamaica Bay. Within sight of the famous skyline of tall buildings—indeed, right inside the city limits—passengers can look out on a wide sweep of marsh land. To be sure, it is not a spectacular sight for tourists. Any of the commuters, fishermen, or swimmers going to Brooklyn's beachside residential or recreational areas might scowl and mutter disdainfully, "Why doesn't the city get busy and get rid of that old swamp?"

Actually, the city, through its park department, is working as fast as possible to restore this one-time habitat of birds to its natural state. If passengers on the subway—or those driving on Cross Bay Boulevard, which runs parallel to the tracks—notice the many ducks and herons that are visible from train or car windows, they will see some of the reasons why the city is so interested.

Bird watchers, getting closer to the scene with their binoculars and telescopes, are finding many more reasons in the increasing numbers of birds of all kinds that have been returning. "Returning" is the proper word, because the Jamaica Bay area was once the stopping-off place for thousands of migrating birds—herons, plovers, sandpipers, rails, geese, ducks, hawks—and even warblers and sparrows. Many birds stayed to nest.

But years of neglect, coupled with the accumulating debris of encroaching civilization, had driven away most of the birds. The once-fresh streams that fed into the bay had been replaced by gushing funnels of sewage, and the resulting water pollution killed the marine food of the birds. Transient dumping, unchecked hunting and the presence of rats further discouraged habitation. In fact, people on Long Island referred to the area as "Garbage Park."

Now signs have been erected where all passers-by can read them—signs that spell out the words, "Jamaica Bay Wildlife Sanctuary—City of New York—Department of Parks."

Signs alone mean nothing. But there is plenty of evidence that this is a thriving refuge. The birds are coming back, and so are the birders. It is not uncommon now to hear New York ornithologists say that it is not necessary to travel some 200 miles to Cape Cod, go down the New Jersey coast, or take the three- or four-hour trip to the end of Long Island in hope of seeing the golden plover, oyster-catcher, curlew sandpiper, stilt sandpiper, Hudsonian curlew, Caspian tern, roseate tern, European teal, snow goose, blue goose, Ipswich sparrow and snowy owl. Many other rare birds have been found in the last three years within the confines of New York City itself—less than an hour away from Times Square by bus, subway or car.

Last spring, bird watchers flocked to the refuge to see the ruff, a rare European straggler. Showing just as much enthusiasm as the others was a visiting professional Danish ornithologist, but he was not paying any attention to the ruff. His attention seemed to be glued to a cackling bunch of common red-winged blackbirds. Finally, he was asked if he did not want to see the ruff.

"Oh, I have those right in my back yard in Denmark,"

. . . the story of a wildlife area that has sprung from "that old swamp."

By MAXWELL WHEAT, JR.

Photographs by the Author

Ernest Restivo, vice-president of the Brooklyn Bird Club, kneels to inspect the simple nest of a piping plover. The sand here has been dredged up to form a dike to impound water, which is proving attractive to ducks and geese.

he said. "But I can't tell you how glad I am to get a chance to see your beautiful red-winged blackbird." There seems to be something for everybody at the sanctuary.

So many bird watchers are coming to the sanctuary that permits are now issued. Scores of individual permits have already been given out, some to famous naturalists such as Edwin Way Teale. Clubs from Long Island, New York City and New Jersey have obtained blanket permits that cover hundreds of members.

The refuge has now become an excellent area for extensive and serious bird study. Last year, a graduate student from Harvard, who was working on his Ph.D. thesis, spent several weeks studying the life cycle of the little green heron. The heronry is becoming more populated, and now affords sites for nesting snowy egrets. The U. S. Fish and Wildlife Service has started banding operations with ducks and geese. Edward J. Whelen, former president of the Brooklyn Bird Club, has kept careful records since the redevelopment of the sanctuary, and he reports 208 species—thirty-nine of them nesting.

In no instance has enthusiasm for the refuge been more dramatically revealed than in the praise given Park Commissioner Robert Moses by one of the city's leading ornithologists. For years the name of Moses has been like the taste of castor oil to the many outdoor devotees who have opposed the roads and parks he has built through natural areas. But last summer a letter appeared in the New York *Herald-Tribune* which described the development of the sanctuary under Moses' leadership as a "phenomenal success." The letter was signed by Geoffrey Carleton, now president of the Linnaean Society of New York, one of the nation's oldest ornithological groups.

If Mr. Moses has resisted the protests of naturalists in some projects, he has just as defiantly resisted strong economic and political pressure in regard to Jamaica Bay. Where ducks and geese now swim, there might have floated hundreds of ocean-going ships. For years official maps of New York listed plans for a second seaport, one that would have been bigger than the ports at Rotterdam, Liverpool and Hamburg combined.

In 1938, Mr. Moses issued a brochure on *The Future of Jamaica Bay*, in which he called for the scrapping of any such plans. This was later done. He used the same brochure successfully to torpedo another plan that was then receiving strong support, a scheme to convert part of the area into a dump. He had an artist draw a sketch for the publication picturing one of the islands piled with debris. Huge clouds of dump smoke were shown drifting towards Brooklyn. This idea, too, was dropped. Mr. Moses went on to outline some of his dreams for the area. These included, besides the sanctuary, bathing beaches and playgrounds on the periphery.

An editorial in the *Herald-Tribune* on June 6, 1938, backed up the plan for the sanctuary. "The very wildness and sense of waste and isolation which led to its being zoned for industrial uses are, now that communications are being opened up, among its greatest assets as

Only a few feet from the footpath on the sand dike, a killdeer has made its nest, and its eggs are being studied by Robert Claremont, conservation chairman of the Brooklyn Bird Club.

Miss Farida Wiley, holding a copy of a bird guide, points out some field marks for a group participating in a field trip to Jamaica Wildlife Sanctuary sponsored by the American Museum of Natural History.

a recreational ground for millions cramped in the brick and steel of civilization. Its wide skies, its long water reaches and low, grassy and mysterious-seeming islands make . . . a strange corner of primitive romance . . ."

But nothing could be done until the waters were cleared of pollution, something that is now being effected through a chain of sewage disposal plants built by the city. Three years ago, the Transit Authority brought in dredges to build up the base for the subway. Mr. Moses got them to dredge enough extra sand to create two impoundments, one on either side of Cross Bay Boulevard. Altogether, enough of the bottom of the bay was brought up to create dikes for more than 200 acres of impounded brackish waters.

But, if left alone, these huge piles of sand would be washed or blown away by high tides and heavy winds. Beach grass had to be planted to hold the sand—a big job. Earlier, Mr. Moses had asked Dr. Clarence Cottam, then assistant director of the U. S. Fish and Wildlife Service, to make a survey. Besides recommending the impoundments and other steps, Dr. Cottam had urged the immediate appointment of a superintendent.

From the sand dike, visitors to the Wildlife Sanctuary can look back across the land area to the Cross Bay Boulevard, with its telephone poles visible in the far background, which cuts across Jamaica Bay.

In August, 1953, Herbert Johnson was named. He had been with the park department for nearly twenty years, working as a soil testing expert and horticulturist. For a long time he had been assigned to the city's golf courses. He helped lay down the carpet-like grass coverings of precisely planned fairways and smooth putting greens, a far cry from his new assignment. But if the sanctuary was to be without an obvious pattern, it would not be for lack of much more complicated ecological planning.

Johnson went right to work. After much preparation—soil had to be tested and equipment obtained—planting got under way. Johnson and a park department crew of six men worked out in the open spaces, often with freezing winds whipping off the bay. Three men were sent to the mainland to dig the beach grass. Each day an outboard motor boat made the trip across the usually choppy bay waters to bring back loads of freshly dug grass. This had to be trimmed, divided and then pushed into the sand by a planting machine. When they finished, that winter, more than a million plants had been inserted, and the sand is now firmly entrenched.

Where once there was only polluted water, there are now wide, sandy dikes that during the migrations are so crowded with shorebirds that they look like the five o'clock rush hour on the Atlantic flyway. The dikes now serve as nesting sites for common and least terns, piping plovers, spotted sandpipers and others. The sand around one of the ponds forms a dike some 6300 feet long, making a nice morning walk for the ornithologist.

During half of the year he will see thousands of ducks, as widgeon grass and other duck food was successfully planted after the salt content of the impounded waters had been reduced. In the nesting season he might see blue-winged teal, black duck, purple gallinule and clapper rail. Last year shovelers nested, the first such record on Long Island in years. Also, in 1956, the black skimmers returned to breed.

In the spring of 1954, Herbert Johnson led an unusual expedition. Taking two trucks, he and his men left early one day for Great South Bay, farther out on Long Island. Working from boats, and using post hole diggers, they dug up quantities of eel grass. Later that day, the trucks hurried back to Jamaica Bay bearing a strange cargo. By nightfall, the shallow waters of the sanctuary had been planted with eel grass—a favorite food of the brant. Then followed a long wait. Eel grass had not grown there since it had died mysteriously on the Atlantic coast twenty years before. Judging by the numbers of brant and geese that have

appeared, the eel grass took hold. More than 3000 brant spent the winter there last year, and for several weeks there were at least a score of blue and snow geese, close enough for all to get excellent views.

An extensive planting program to attract land birds is being carried on by Mr. Johnson—sweetfern, pasture rose, pokeberry, Japanese pine, and other plants—even poplar trees. Some of the plants, like the multiflora rose, would never be found in any respectable garden. When Mr. Johnson's father, a veteran horticulturist specializing on ornamental landscapes, first came to see his son's work, he practically threw up his arms in despair and cried, "Good grief! If you don't get rid of those weeds they'll fire you!"

Johnson explained that the plants were not for people, but for birds. The plants were to provide food and cover, for Johnson hopes that the sanctuary also will become an important haven for land birds. Pointing to some of the small shoots and sprigs he said, "Wait until all this becomes a tangle. Then this place will be thick with sparrows and warblers."

Even now they are fairly thick. Bird watchers often find interesting species like the seaside and Ipswich sparrows, the dickcissel, Lapland longspur, bobolink, short-billed marsh wren, short-eared owl, mockingbird and nine species of hawks. Not long ago both the northern and loggerhead shrike were recorded in the sanctuary.

The planting would not have progressed as far as it has had not Johnson started his own nursery. Not enough funds were available for all the plants he needed, so he has always kept a sharp lookout for cuttings and seeds along the highways and in the parks. These he plants in his nursery. When the young plants are big enough, he sets them out in the proper areas in the sanctuary, all at a cost of next to nothing.

In just three years, the sanctuary has made great strides. Johnson has the month of October, 1958, in mind, for that is when the American Ornithologists' Union, of which he is a member, expects to hold its seventy-fifth anniversary meeting in New York. Birders will come from all over the country, and New York will have its own impressive birding area to show them—right inside the city limits.

Big Burl

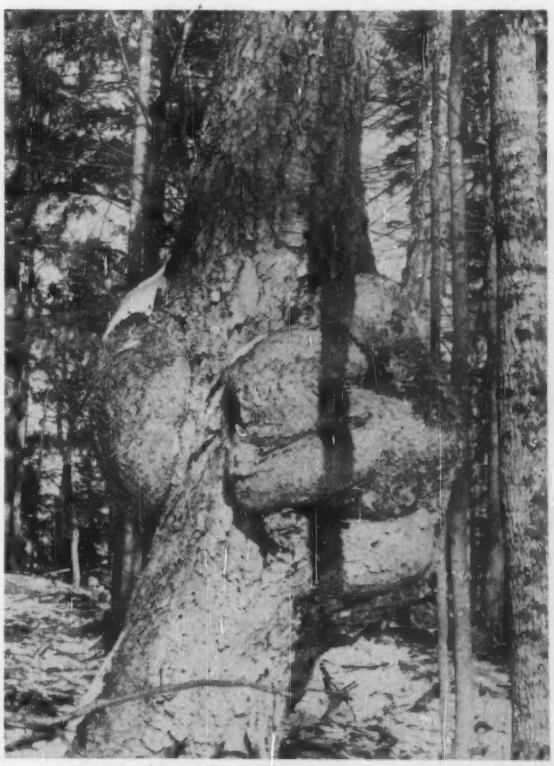
By JANE HUTCHINSON

Photograph by the Author

ON A LIVING yellow birch tree in the Huntington Wildlife Forest in New York's Adirondack State Park, there is a burl that measures an inch less than five feet in height, completely encircling the tree except for a space ten inches wide. The tree itself, just below the burl, is thirty inches in diameter.

The exact cause of a burl like this, which is a form of gall, is not fully understood. The United States Department of Agriculture *Yearbook of Agriculture* for 1949, on the subject of trees, says that a burl is a hard, woody growth on the trunk or root of a tree, usually the result of an entwined growth of a cluster of buds. Such a gall would not be infectious, and would not hurt the tree pathologically, although an attempt to make lumber from such a malformed tree would be awkward, to say the least.

A burl of this kind does not seem to affect the health or growth of the parent tree, although there are other kinds of tree galls that may be caused by pathogenic, or disease-causing, organisms. Small, fist-sized burls are often used for paper weights, or pen-and-pencil holders, while larger sizes may become lamp bases or small tables. Still larger ones, because of their convolutions in grain, make highly attractive table tops when slabbed, debarked, stabilized against checking, smoothed and polished. But beware! It is a man-sized job to make a table top of a big burl—you had better be equipped with plenty of time and patience!



A king-sized burl on a yellow birch in New York's Adirondack State Park is nearly five feet in height.

Swifts

and their nestlings

By MARGARET WHITTEMORE

PHOTOGRAPH BY HELMUT SICK

A DUSKY, streamlined bird, that from April to October "lends a joyful wildness to our urban sky," may well be grateful to the man who invented chimneys. The swift, while sharing our dwellings, still maintains an aerial aloofness, seldom coming in contact with its landlord. Acquaintance with this elusive sky dweller offers a real challenge to the ornithologist, requiring the agility of a monkey and the sure-footedness of a steeplejack.

In order to observe at close range the descent of a flock of swifts into a church chimney, George Miksch Sutton, some years ago, stationed himself as unobtrusively as possible on the rim of the brickwork, hanging on by one leg and arm. "I can't recommend climbing around chimneys for everyone," he warns. "There are those who shouldn't do it."

PHOTOGRAPH BY ROBERT R. KNICKMEYER

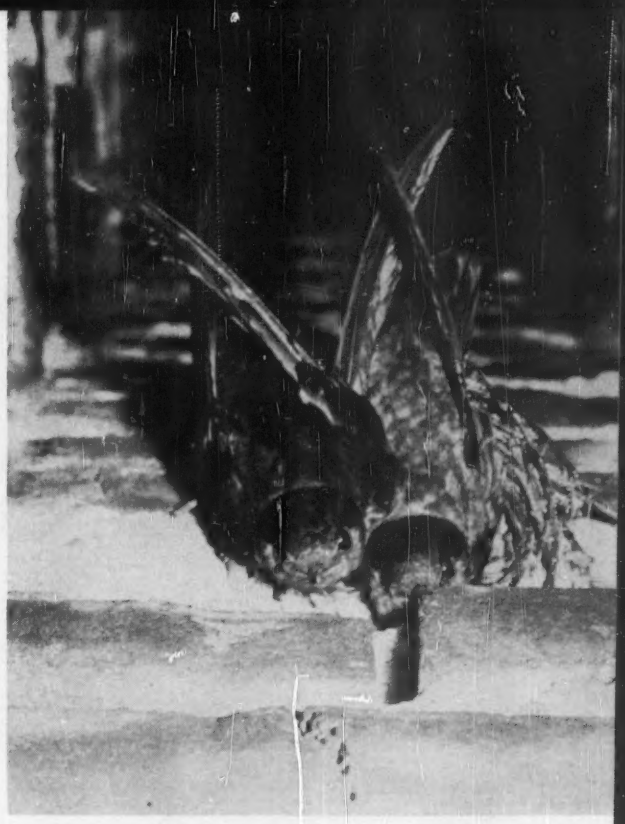
Twenty-seven days after hatching, this fully fledged young chimney swift is ready to leave his man-made birthplace. The photograph was obtained by lowering a flash-equipped camera into the depths of the flue.

Robert R. Knickmeyer, of St. Louis, has succeeded in obtaining clear flash-bulb pictures of the swift's nesting activities by climbing to the roof of his home and lowering a camera into the cavernous depths of the flue. His photographic record, starting with the incubation of three white eggs, ends with a fully fledged bird preparing to leave the chimney, twenty-seven days after hatching.

In 1915, Miss Althea R. Sherman, of National, Iowa, dedicated herself to the study of chimney swifts by building a tower thirty feet high and nine feet square, in the center of which was an artificial chimney of pine flooring. Opening into this shaft were two glassed windows and a door, as well as auger-holes through which to peep. Her day-by-day records, preserved in the Iowa State Department of History and Archives in Des Moines, probably comprise the most detailed account ever made of the swift's nesting habits. The period covered was from 1918 to 1936.

"During the many summers of intimate living with the chimney swift," Miss Sherman wrote, "I have never found it a subject for criticism in any respect—no evil has been detected in its relations with its own or with other species. In short, it appears to be a paragon of perfection—the bird that properly might be chosen as the emblem of peace."

For six summers the same nest was used, although Miss Sherman noted that the frail hammock of twigs was given a bit of repairing each year by the mother bird. Eggs were invariably laid every other day, and incubation required eighteen or nineteen days. An extra "nurse-maid" often joined the mated pair in hunting insects for the young, which were fed by regurgitation. The space between meals was about an hour, varying with weather conditions. Sixty-four days elapsed from the laying of the first egg until the young could feed themselves. For two weeks, after the brood was on the wing, the entire family, including the "nurse-maid," continued to roost in the chimney



In this inside-the-chimney picture, the male chimney swift, at the left, seems to be sharing housekeeping duties with the female. Swifts at rest always use vertical surfaces —chimneys, hollow trees, old wells or the walls of abandoned buildings—and never alight on twigs or wires.

at night, but they vacated their quarters during the day.

The chimney swift tower still attracts many bird enthusiasts to the Sherman homestead. In her will, Miss Sherman stipulated that no cats or BB guns should ever be allowed on the six-acre tract of land. The place provides sanctuary for other winged creatures that are described in her book, *Birds of an Iowa Dooryard*.

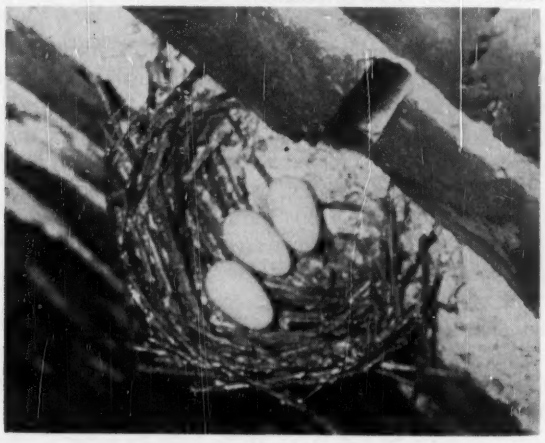
From 1934 to 1944, a concerted nation-wide effort at swift banding during spring and fall migrations resulted in the determination of the winter home of the swift, the only common bird whose hideout during that season had remained a mystery. The secret came out when Indians near the headwaters of the Amazon, in Peru, found thirteen aluminum bands. Great was the excitement among ornithologists, when these bands reached Washington in August, 1944. Can it be that our citified *Chaetura pelagica*, while wintering south of the equator in an untamed wilderness, makes friends with its non-migratory cousins? Five species of closely related Chaeturine swifts are known to be permanent residents of the Amazonian regions.

Dr. Helmut Sick, a German ornithologist living in Rio de Janeiro, has documented the nests of five of the twelve species of Brazilian swifts, including the *Chaetura andrei*. He has noted this bird's shifting residence from hollow trees to man-made chimneys. The much larger white-collared swifts often build in rock crevices back of waterfalls. The fork-tailed *Reinarda squamata* attaches its cradle of feathers and tufted plant seeds to the withered fronds of the "burity" palm, far from human habitation.

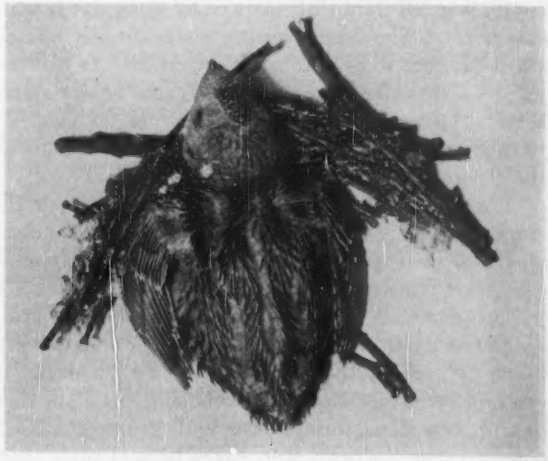
Mrs. Adda Abendroth, a bird enthusiast of Teresopolis, Brazil, has made a special study of the dark brown *Chaetura andrei*, whose numbers have greatly increased during the past twenty or thirty years, because of the erection of suitable nesting chimneys in that resort town. By the end of December, the young are usually ready to leave their birthplace, Mrs. Abendroth reports. By April, the birds are often absent from the village all day, returning at nightfull to their sleeping quarters. From May to August, they seldom come to town, spending their nights in a tall chimney that rises from a

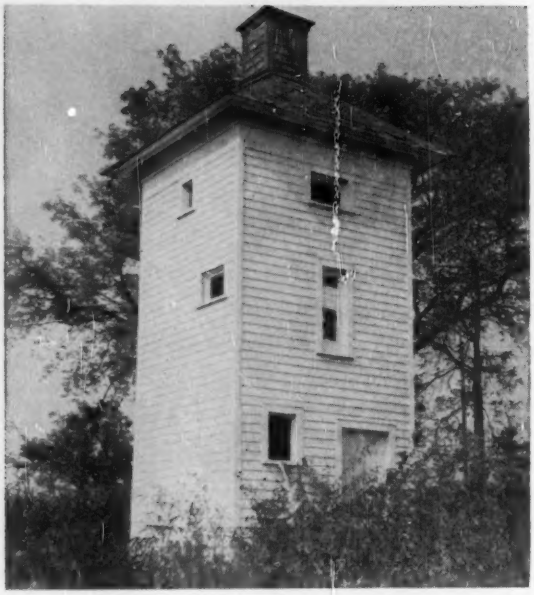
A close-up shot of a swift's nest, with its three eggs, shows it to be constructed of twigs. According to the observations of Miss Althea R. Sherman, of National, Iowa, the eggs are laid every other day, and incubation requires from eighteen to nineteen days.

PHOTOGRAPHS BY ROBERT R. KNICKMEYER

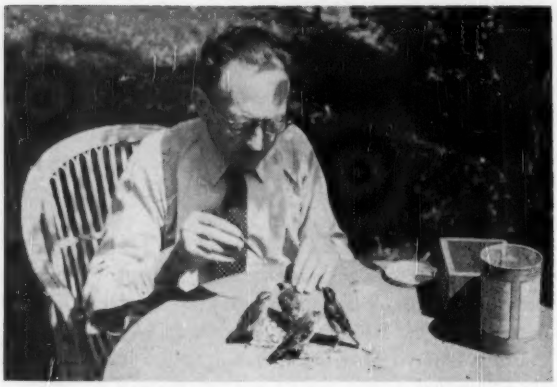


This partially fledged youngster is fed by its parents about once an hour, the time varying somewhat with weather conditions. The parents are sometimes assisted-in hunting insects by a "nurse-maid."





PHOTOGRAPH BY LAURENS E. WHITTEMORE



Above, Mr. E. Moeri-Rufer, a watchmaker of Saint-Imier, Switzerland, uses a feeding tube that he devised for young swifts. At the left is the tower, thirty feet high and nine feet square, used by Miss Althea Sherman in her studies of the swift between the years 1915 to 1935.

narrow valley some distance from Teresopolis, and flying over the lowlands during the day.

During the 1955-1956 nesting season, Mrs. Abendroth was successful in raising three swiftlets that had fallen into a friend's fireplace as naked nestlings. All through the year she had been preparing for such a contingency, collecting ant larvae and preserving them, raising mealworms, and experimenting with other insect cultures. One mixture she prepared consisted of equal quantities of cottage cheese and dry ant larvae, plus a drop of cod liver oil and a pinch of vitamin-calcium powder worked into a paste. When mealworms are used, they must be cut in sections. From three to five make a meal, depending on their size.

Mrs. Abendroth uses a feeding tube devised by a Swiss watchmaker, Mr. E. Moeri-Rufer of Saint-Imier. With a little wooden piston the food is pushed through a glass tube into the bird's open bill. Mr. Moeri-Rufer has rescued in a single year as many as 235 European swifts that fell from their nests under eaves and in wall crannies. A film demonstrating his method of feeding them has been shown all over Switzerland. In his bird nursery he has also tended an injured eagle, an owl minus a wing, young martins, and skylarks. He recommends to others who attempt to raise young swifts the use of the glass feeding tube.

"Give your birds every hour a tube full of fresh ant larvae or ant eggs," he suggests. "About one hundred fill the tube. Push the larvae gently into the bottom of the gullet; thus not a single one gets lost. It takes a certain amount of practice. Within ten minutes I manage to feed ten or twelve swifts. It must be done quickly if one has a nest full of seventy-five or eighty birds. If you feed them this way, you can be ninety-nine percent sure to raise all of them. Be careful to keep the birds warm enough. When I have naked birds, I place their box on an electric cushion. A number of birds will usually keep each other warm with no need of artificial heat."

In raising a few displaced swiftlets that might otherwise have perished, I have fed scrapings of raw beef, cottage cheese, and bread soaked in boiled milk. Tiny morsels of food, placed on the tip of a finger, were pushed down into the bird's throat. A tube, such as Mr. Moeri-Rufer devised, can be made by cutting off a portion of a plastic drinking straw, and using a small pencil or metal rod as a piston to push the food through the straw. By six o'clock every morning our birds were clamoring for breakfast, bubbling over with joy when it appeared, and clamoring for more before the first bite was swallowed.

There was much preening, stretching, and exercising in the deep straw waste-basket to which they clung day and night, their little bodies supported by ten spiny-tipped tail feathers. Like the hummingbird to which the young swifts were related, they could whir their wings so rapidly that they became a mere blur. The first venturesome glide from the basket rim was followed by two or three weeks of practice in flying around the rooms. They would sometimes dart to our shoulders or cling to a dress in a friendly manner.

When the day came for our fledglings to launch forth upon their airy career, it was with some understandable reluctance that we took them out-of-doors. We watched proudly as they started their ascent, circling higher and higher until they were far above the roof. As other swifts joined them, we took comfort in the thought that our young ones would soon learn from their elders how to catch insect prey and attain complete mastery of their native element.

We who have won the confidence of animated swiftlets can never again think of those scythelike forms as mere silhouettes against a canvas of sky. Their fleet movements and gay twitterings now bring a special thrill. On our chimney, we have hung out a gilt-edged invitation: DO DROP IN AND MAKE YOURSELVES AT HOME.

Pawpaw, the Custard Tree

By R. R. THOMASSON

Photographs by the Author

THE PAWPAW lends a tropical air to our landscape, and gives us a homegrown custard ready for a between-meal snack. Most of the members of the custard apple family are to be found in the tropics, but our native pawpaw is found over most of the eastern half of the country, as far north as New York, as brushy thickets and—occasionally—as a small tree.

The farm boy finds much of interest in a pawpaw thicket. In the springtime, the long, slender sprouts are treasured as a source of whistles, whips, and fishing poles. In late summer and fall, the ripened fruit demands attention as food.

On the farm that I knew as a boy, we gathered the choicest pawpaws from upland bushes that grew along the old rail fences. Here we had a deep, red clay loam that grew pawpaw bushes to perfection, and ripened fruit with an especially appealing flavor. Despite a pride in keeping fence rows clean of weeds and brush, no one seriously considered cutting the pawpaw sprouts that grew up on both sides of the fence to hold the rails in a vise-like grip. Pawpaw bushes also grew along a river bottom, as an undergrowth to oaks and other forest trees, in a deep, fertile soil. But the upland pawpaws had a better flavor, and a thicker, tougher skin.

No doubt today, just as fifty years ago, farm boys vie with raccoons, opossums, and numerous birds for the ripening fruit. Quail, turkey, kingbird, catbird, robin, veery, and red-eyed vireo all appreciate the ripened fruit. In that day, when we walked to school instead of riding a bus, we found pawpaws especially appetizing on our way home from school.

The proper way to enjoy pawpaws, as every schoolboy in pawpaw country knew, was first to gather an ample supply of brown, ripened fruit at a convenient place along a rail fence where the top rail was broad and flat. Then, comfortably seated on the top rail, we held the pawpaw tenderly near its center with both hands, and deftly broke it in halves. The rich, custard-yellow pulp of one half was squeezed from the skin into the mouth very much as tooth paste is squeezed from the tube. The seeds were allowed to fall at random. The second half followed the first, and then another pawpaw was gently broken. The hungry schoolboy, adroit pawpaw eater that he was, could consume half a dozen fair-sized fruits without leaving a trace of the custard on fingers or lips. Each fruit, three to five inches long, held a cupful of delicious custard encased in a green skin that matured to yellowish-green, and finally to an attractive brown, signalling its perfect ripeness to every pawpaw enthusiast.

A time-honored recipe for a pleasant afternoon calls for the mixing of a young man with a pawpaw tree and an old rail fence. Stephen Chapman of Columbia, Missouri, demonstrates the technique of breaking a pawpaw in half and extracting its rich pulp.

There is a considerably diversity of opinion regarding the pawpaw as a food. Harriet L. Keeler, in *Our Native Trees*, tells us that "Although credited in the books as edible and wholesome, one must be either very young or very hungry really to enjoy its flavor." On the other hand, the Illinois Department of Conservation says, "The fruit when ripe is delicious and nutritious." Some years ago, I gathered some of the ripened fruit from the thickets of my childhood days in southeastern Missouri, and offered them to acquaintances on the campus of the University of Missouri. One professor thought that, in time, one might be able to cultivate a taste for pawpaws. I found no enthusiasm among those who had never previously tasted the fruit.

There is a great difference in the flavor of pawpaws

With its large, light green leaves and dark brown bark, the pawpaw ranges through the eastern States as far north as New York, and west to Nebraska. Its growth is rather shrubby in the north, but the pawpaw may become a tree thirty to forty feet high in the southern part of its range.

because of varietal differences, ripeness of the fruit, and the soil on which they grow. The reputation of the pawpaw as an edible fruit would undoubtedly be improved if it were always eaten at the proper state of ripeness. Some people recommend that the fruit be picked when it begins to soften, and then allow it to ripen in a cool place. At one time, nurseries offered named varieties of pawpaws for sale. These were natural selections, taken from the wild, and bore such names as Uncle Tom, Arkansas Beauty, Early Best, Hope's August, and Hope's September.

There appears to be a white as well as the usual yellow-fleshed pawpaw. But if there is a white-fleshed variety in my own State of Missouri, I have never heard of it. Those familiar with it describe it as inferior to the yellow-fleshed fruit.

The botanical name of the pawpaw is *Asimina triloba*. The generic name "Asimina" is of Indian origin; and, as might be expected, the Indians throughout its range took full advantage of the fruit, while the stringy inner bark of the pawpaw was at one time used by the Louisiana Indians as raw material for fiber cloth.

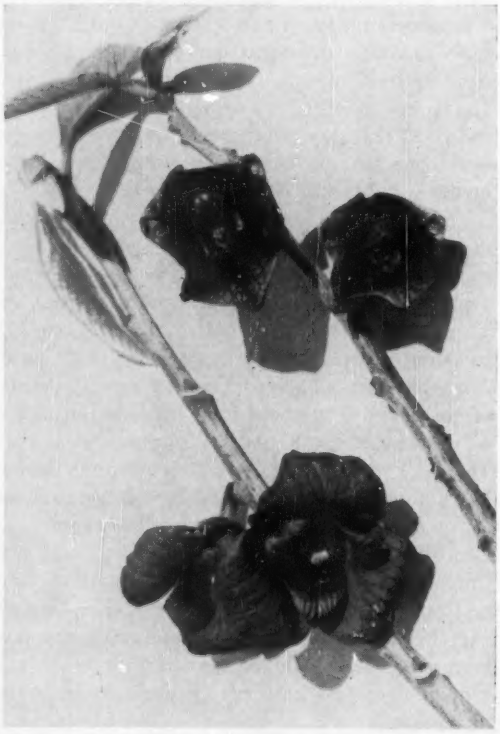
Early white explorers appreciated the merits of this tree, also. The pawpaw served a useful purpose during the Lewis and Clark expedition, and we are told that when the men ran short of food on their return trip, they found themselves in pawpaw country during the ripening season. With a ration of only one biscuit a day per man, the pawpaws were doubtless gratefully received. The first recorded use of the fruit as a culinary item in America, however, was made by De Soto's expedition into the Mississippi River Valley, way back in 1541.

A leaflet issued by the U. S. Department of Agriculture on the pawpaw recommends that the fruit be eaten with cream and sugar or used as filling for custard pies. Beating the pulp up with cream is mentioned as a method of serving the fruit; and it is even suggested that ice cream may be made by using cream and pawpaw pulp.

A prize of fifty dollars for the best pawpaw, and a similar prize for a photograph of the largest pawpaw tree were offered forty years ago by the American Genetic Association, and some interesting results were obtained. The largest tree reported was one that measured five feet in circumference, three feet above the ground, and stood twenty-five feet high. It was found at Boonville, Indiana, by C. P. Close, of the Bureau of Plant Industry of the U. S. Department of Agriculture. The prize winning fruit came from Ironton, Ohio, and ripened during the early part of September. Three of the largest in the prize winning lot weighed from ten to twelve ounces, and the tree from which they were gathered grew in a dense thicket of locusts and mulberries. Measuring sixty-eight inches in diameter, it stood twenty feet high, and produced half a bushel to a bushel of fruit annually.

Although occasionally a lone pawpaw tree of consid-

The flowers of the pawpaw may measure nearly two inches across, and when they are fully opened the color is a rich deep purple that makes the plant desirable as an ornamental, and is more suggestive of the tropics than the temperate zone.



erable size is found, more often it grows in thickets of tall, straight shoots, or perhaps fair-sized bushes. The individual small tree growing in the open may attain a height of twenty to thirty feet, and sometimes even more. A good tree may be expected to bear fifty to one hundred fruits.

While the large leaves, six to twelve inches long, give the pawpaw a tropical appearance, its range is from western New York to Michigan, south to Texas, and back to northern Florida. Dewight M. Moore, in *Trees of Arkansas*, tells us that the pawpaw grows throughout that state, except in the overflow areas of the larger rivers. He reports that in mountainous areas it occurs on moist northern slopes, protected gullies, coves, or small stream valleys, usually occurring as an "under-tree" in stands of white, red, and chinquapin oak, shag-bark hickory, and sugar and red maples.

The wood of the pawpaw is brittle, and we ordinarily think of the tree as rather short-lived; but there are some instances to the contrary. In connection with the contest already mentioned, W. D. Hewitt reported trees at Burlington, New Jersey, eighty years old, while R. R. Bane of Wellsbury, West Virginia, tells of a pawpaw patch "the trees of which must be nearly 100 years old, as I am 59 myself and the trees were large when I was a boy." James Mooney, of Martinsville, Ohio, reported trees sixty years old that looked as though they might live another sixty years. He tells of several distinct varieties, a small early yellow, a large oblong yellow, and several kinds of white pawpaws. He said, "The pawpaw is one of the slowest growing trees I ever saw. It will thrive better in thin woods where all other underbrush has been cut out, where the overhanging boughs do not interlace or cut out the sunlight."

Even before the mahogany-colored blossoms with four petals appeared on the bare branches in the pawpaw country I knew as a boy, we were making mental note of likely places to cut long, straight sprouts for fishing poles. They were light, relatively flexible, and entirely acceptable to farm boys. Somewhat larger sprouts, or baby saplings, were frequently used as hoe-handles. Although quite serviceable in that capacity, they lacked the appeal of the pawpaw fishing pole. If fishing were not the order of the day, we sometimes spent hours fashioning pawpaw whistles and whips.

Pawpaw whistles are made early in the spring, when the sap is up, in the same manner as willow whistles. After cutting the end of a twig diagonally, the bark is cut through all the way into the wood, entirely around the twig, some two or three inches from the end. By gently tapping the bark, it is readily slipped from the twig, like a sheath. After the proper notching, the bark is replaced, and the whistle is ready to annoy all and sundry in the vicinity.

The fruit of the pawpaw varies from three to five inches long, turning dark and wrinkled by the time the soft flesh is in condition to eat. It has been suggested that a taste for pawpaw fruit is something that must be acquired.

A rather good imitation of a cattle whip may be made by stripping the bark from an eight-foot sprout, splitting it into four strands, and plaiting it. The bark is peeled to within a foot of the big end of the sprout; then the peeled part is cut off.

The blossom of the pawpaw, although not conspicuous, is interesting and rather attractive. Unfolding when the leaves are quite small, it has something of the appearance of a small reddish-brown cup, with six shining petals, three long ones and three short ones.

On the farm of my boyhood days I found violets, bloodroot and May apples growing congenially in the springtime with the pawpaw bushes along the rail fences. But it was the fragrant ripe fruit in the fall that so endeared the bushes to me!

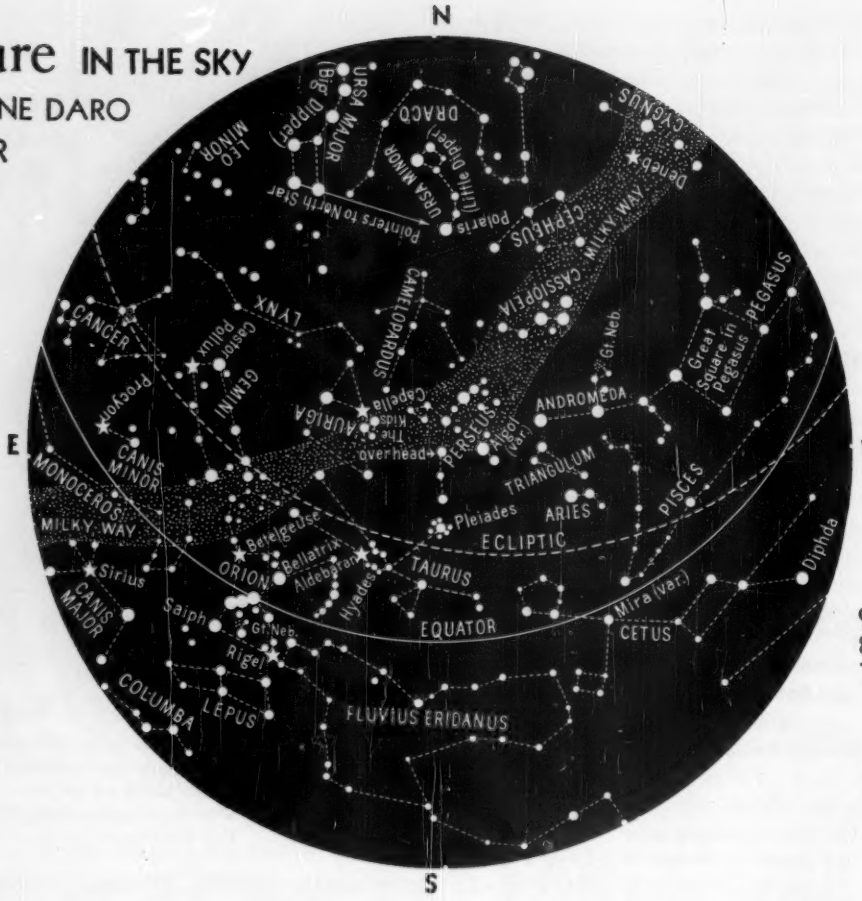
LIKE A WHITE WING

The drifted snow extending like a wing
Covering buried beauty is a lovely thing
Waiting for the cyclic turn of hours
To flake the earth again with snowy flowers.

Harry Elmore Hurd

Nature IN THE SKY

By SIMONE DARO GOSSNER



9 P.M., Jan. 1
8 P.M., Jan. 15
7 P.M., Jan. 31

★ 1ST MAGNITUDE
● 2ND " " "
● 3RD " " "
● 4TH " " "
• 5TH " " "

To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. Times given are for Local Standard Time.

The Heavens in 1958

THE YEAR 1957 will long be remembered by astronomers as one of unusual and spectacular occurrences.

Dwarfing everything else, at least in the headlines, was the successful attempt, on October 4, by Russian scientists, to launch an artificial satellite in an orbit around the earth. A multi-stage rocket placed the tiny moon in an elliptical (oval) orbit off-center with respect to the earth, so that its closest distance to earth—as this is being written—was about 140 miles, its farthest being about 400 miles.

The last thrust on the final stage of the rocket caused that final stage itself to circle around the earth in a smaller orbit. The fact that this final stage is traveling in a denser part of the atmosphere, coupled with the fact that, according to observational evidence, it is tumbling in its path, will increase the drag and force it to spiral back to earth, probably burning up en route.

The satellite itself, on the contrary, is still traveling in an orbit not too different from its original one. Although it is showing the effects of a slight atmospheric drag, it could still remain "up there" for another two or three months. It has now lost much of its scientific value, since its batteries gave out on October 25, or shortly thereafter.

As of now, the first launching of the U. S. Vanguard satellite is being planned for December, 1957. More details about artificial satellites and the U. S. Vanguard project may be found in *Nature Magazine* of October 1955, December, 1956, and March, 1957.

Two magnificent comets graced the heavens during spring and summer. The first was comet Arend-Roland, originally discovered in November, 1956, which became visible to the naked eye at the end of April and early May, 1957 (see *Nature Magazine*, October, 1957). The

other was comet Mrkos 1957d, discovered by Mrkos in Czechoslovakia. This comet was so bright that several people—not all astronomers—discovered it independently. Official credit for the discovery was given to Mrkos, however, solely on the basis that his telegram was the first to reach the international clearing house at the Royal Observatory of Copenhagen, Denmark. Comet Mrkos was particularly remarkable for its beautiful tail, fanning out in graceful streamers.

As of the end of October, six comets had been reported for 1957, not counting Arend-Roland, which is credited to 1956. In addition to comet Mrkos, there were two new comets and three periodic ones. Periodic comet Kopff was reported by Van Biesbroeck at the Yerkes Observatory on February 20; Encke's comet was seen by Jeffers at the Lick Observatory on July 25; periodic comet Reinmuth I was recovered by Elizabeth Roemer at the U. S. Naval Observatory (Flagstaff Station) on September 20. The two new ones were comet Rijves 1957b, the discovery of which was not confirmed by subsequent observations, and comet Wild-Burnham 1957f. The latter faded away rapidly and was noted mostly for its unusually fast motion.

The International Geophysical Year was inaugurated on July 1. Among the projects it is sponsoring is an intensive program for observations of solar activity. As if to oblige the astronomers, the sun exhibited in the last few days of June and early July a remarkable display of sunspots. One large sunspot group, photographed on June 24, is considered the largest seen in the past forty years in that region of the solar surface.

Solar eclipses were relatively unimportant in 1957.

In 1958, on the contrary, there will be two large solar eclipses. On April 19, an annular eclipse will occur over most of Asia. The path of the annular phase will start in the Indian Ocean. It will then cut across Siam, Indo-China, and Formosa, and will end in the western Pacific Ocean. The partial phase will be visible over a large area, including Asia, Indonesia, the Philippines, Japan, northeast Alaska, the northeastern part of the Indian Ocean, and the western Pacific Ocean.

On October 12, 1958, there will be a total solar eclipse in the south Pacific area. The partial phase will be visible in the eastern parts of Australia and New Guinea, in New Zealand, the south Pacific islands, the Palmer peninsula of Antarctica and the southwestern part of South America. The path of total phase will touch little land. Altogether, there are only eight islands scattered within the region of totality. All are atolls and are accessible only to small craft. They are Atafu, Nukunono and Fakaofo of the Tokelau Islands; Danger, Nassau and Suvarov of the Line Islands; and Fenua Ura and Mopihaa of the Society Islands. Several expeditions are being planned, mostly for Danger Island, which, in spite of its forbidding name, still offers the best facilities for the establishment of observing stations for the event.

OFFICIAL U. S. NAVY PHOTOGRAPH

Comet Mrkos 1957d, photographed on August 23, 1957, with the fifteen-inch refractor of the U. S. Naval Observatory.

Only one eclipse of the moon, the partial eclipse of May 3, is expected in 1958. It will be visible in the western part of North America, the Pacific Ocean, eastern Asia, Australia, the southeastern part of the Indian Ocean, and Antarctica. It will last only 26 minutes from beginning to end. The magnitude of the eclipse will be 0.015 of the moon's diameter, indicating that it will barely nick the surface of the moon. On the west coast the eclipse will occur at around 4 AM, local time, and is hardly worth getting out of bed. . .

But you will almost have to get out of bed early in the morning throughout 1958, if you wish to see most of the planets. Except for Mercury, which always swings from the evening to the morning sky, and vice versa, every two months or so, all the other planets will mostly be in the morning sky.

Venus will appear as an evening star until January 28, and again from November 11 to the end of the year.

Mars will be in the evening sky only from November 16 into the following year.

Jupiter will be seen in the evening sky from April 17 to November 5, and Saturn from June 13 to December 20.

In the month of January, the (*Continued on page 50*)

Nature IN THE SCHOOL

By E. LAURENCE PALMER

Professor Emeritus of Nature and Science Education, Cornell University, and Director of Nature Education, The American Nature Association

Amphibia in Schoolrooms

IT IS ALMOST a foregone conclusion that if a school is near open country a youngster will come into class some morning in the spring months with some "frogs' eggs." These may be salamander eggs, or toad eggs, or frogs' eggs, but for the most part they will pass under the generic name of frogs' eggs. What happens to them after that is our present concern.

If you, as a teacher, have any interest in encouraging the youthful collector, or of seeing what might happen to those eggs, it might be well to look over this month's special insert, or the earlier thirtieth insert. Then, possibly, you can get better results.

One of the best conservation lessons on these eggs may be the recognition of the fact that if the animals involved are good, it is poor policy for the school to see how many they may get. If any rewards are to be forthcoming, they may rest with helping make a representative collection of the kinds of eggs to be found locally. One bunch of each kind should usually be more than enough for a single classroom, and even that might be too much. Have the children look for eggs that are laid separately; eggs that are enclosed in one jelly envelope; eggs enclosed in envelopes that are themselves enclosed in another envelope, and so on. Then watch for eggs that are black, black and white, brown and white and other colors. Watch for eggs that are laid in strings of jelly, and for eggs that are to be found in paired strings of jelly. Watch for eggs in which the jelly covering has been covered with silt, and for eggs in which the jelly has become green with algae. Then, again, watch for egg masses in which some of the eggs have apparently died. If you wish to study some of the enemies of eggs, put a newt or two in the aquarium or jar in which the eggs are being kept. Then, as the little tadpoles free themselves from the jelly coat, see how quickly the newt grabs them up. You might like to get some idea of how many such little tadpoles a single newt may eat. In that way, you may get some idea of how valuable newts are, if we consider tadpoles as harmful, or how bad they are if we think that tadpoles are useful. Of what better object lesson can you think? Then, too, an aquarium on a windowsill draws youthful observers, and all you have to do is suggest the value of what is seen.

Observing tadpoles

As soon as the tadpoles of many amphibia appear, the young may hang themselves vertically on the walls of the aquarium. Now a hand magnifying glass is a convenience. Watch the changes that take place in those little animals. When the gill loops appear, watch the blood circulate through them and see if the movement is continuous or rhythmic. What explanations suggest themselves for what you see?

When your tadpoles begin to feed, notice how, for the most part, they get their food from the surface of things. They move along, removing some of the accumulated slimes that may be present, and their trails frequently may be seen. Does this suggest that a well-fed tadpole is likely to be seen in an aquarium that has been kept spotlessly clean, or one in which there are some ooze-covered surfaces? Figure out your own answers to this situation.

Make a list of some of the more conspicuous needs of living things. This may include food, water, light, shelter, proper temperature, air, sanitation, room and so on. Your aquarium of young frogs, toads or salamanders may provide you with dynamic examples of the problems presented by these factors.

Of course, you may wish to get some idea in music of the different songs of amphibia. The chart section has indicated a good way in which this may be studied. Try it out.

Reducing the surplus

If your aquarium develops a surplus population of tadpoles, do not throw the extra animals away. Just introduce into the aquarium different kinds of animals—such as tropical fishes, crayfish, goldfish and so on—and record what happens, particularly which of these attack and eat the tadpoles. When the population has been reduced satisfactorily, you may remove the destructive animals and begin to develop some appreciation of balances that exist in the aquarium, and how these may be maintained by management. There is probably no better way to appreciate management than to engage in some actual management. Management is often the key to good conservation, and conservation may well be the goal of our dealings with our environment. The amphibia offer superior possibilities to make conservation function.

It may surprise some of you to know that, in a few States, there are laws governing the taking of certain amphibia. There are certain months when it is illegal to take them, and certain methods that are prohibited. The seasons are, of course, synchronized with the breeding season, and are designed to prevent wholesale collecting at times when there is abnormal concentration of animals in a given area. The methods involved usually concern the prohibition of the use of devices that will either prevent the animals from their natural migrations to breeding grounds, or direct these migrations in such a manner that the population might be unreasonably reduced.

Checking locally

These laws are not national, and so it might be well for a teacher to make inquiries about the local situation, and then chart a course that may show how, in all probability, there is a sound reason for the existing law. These reasons may not always be appreciated easily, but those who have had field experiences with the animals have seen what they do, under the strain of reproducing their kind, and will understand the situation. Possibly this may be excellent training in citizenship, because almost invariably the better nature of people determines what is done, and if people realize early in

life that laws are commonly made to protect the interests of all, in the long run there may be less likelihood that laws will be ignored or flouted as impositions on individuals or groups.

Some may be inclined to say that we should have uniform laws all over the country. Any study of amphibia will show how unreasonable such a situation would be so far as they are concerned.

The special emphasis on amphibia in this number of *Nature Magazine* might cause some of us from the North to think that it would be better if we brought this subject up later in the year. Did we effect this North-favored delay, the rules we might pass based on conditions in the North would be ridiculous for application in the South. For many years fish laws were unreasonable because it was felt that seasons should be the same in adjacent States. Seasons are set to permit natural reproduction to save a species, and so the laws have to agree with the biological facts. This our study of amphibia may help us understand.

Evergreens and Flowering Shrubs

By Katherine M. P. Cloud. New York. 1957. Greenberg. 256 pages. Illustrated. $4.95.

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THE Nature CAMERA

By EDNA HOFFMAN EVANS

Nature is a great artist, one that abhors monotony, and yet one that both creates and repeats beautiful combinations of forms. This is well illustrated by the picture titled "In Windy Weather," taken by William L. Van Allen of Bend, Oregon. The print received an honorable mention in last year's Chicago International Exhibition of Nature Photography.

Looking at the Record

UNBELIEVABLE AS IT MAY SEEM when we look back and take stock of the days, another year has rolled around. It is time to begin writing "1958" instead of "1957" on letters, checks, and other pieces of correspondence that need to be dated.

Truly, it does not seem like twelve months—365 days—ago that I sat down and wrote my photographic New Year's resolutions for 1957. And now it is time to do the same for 1958. But first, I want to check back over the things I resolved to do or not to do a year ago, and see how many of those fifteen resolutions I actually have kept. That "Resolutions" section interested a goodly number of readers, judging from the letters I got, and I wonder whether others have had any better luck in keeping their resolutions than I.

To begin with, I resolved to take fewer pictures, and to try to make the ones I did take better. That was to overcome my habit of taking several shots per subject, in the hope that one might turn out to be a good one. That resolve, I think, I have been able to keep to a large extent. Looking back over my year's collection of slides, negatives, and pictures, I find that I do not have as many duplicates as I previously did. If I liked a subject or scene well enough to take several shots, I tried to vary the angles and exposures so as to have different results each time.

Duplicating shots

There have been instances, I must admit, when I have backslid. Knowing, as I did in Cuba last summer, that it might be a long time before I "passed that way again," I shot unnecessary duplicates of the Morro Castle, *Maine* Monument, and other scenes, just to be sure I would have good ones for the record. But, in most cases, I can count on different views each shot.

Second: I have to some extent eliminated the tendency to "snap and hope." Perhaps I have missed a few shots by taking too much time in getting set. On the other hand, I also have fewer fuzzy, poorly exposed results to mourn over.

Third: I have kept a more accurate record of some of my shots so as to avoid repeating errors unnecessarily. But this is a place where I still have much room for improvement.

Fourth: Have I paid more attention to subjects close at hand? Well, y-e-e-e-s, I think so, but the grass still looks greener on the other side of the fence.

Fifth: Without losing interest in my Camera Club's contests, I have also kept myself amused with subjects that interest me. Actually, Camera Club ideas have been an additional stimulant to taking more varied and—I hope—better pictures. Camera Club membership has enriched photography as a hobby. More on the subject of Camera Club membership later.

Pleasing judges

Sixth: In continuing to take pictures that suit my own fancy, I have also managed to please some judges and have collected a few ribbons in the process. I am best in the fields I like: Nature, outdoors, landscapes, plants and animals. I have never won an award (or even a nod of approval) for a pattern, still life, or portrait shot—but I am happy when those who like them do.

Seventh: In spite of my resolution to remember that some pictures are for the record only, I continue to be disappointed in results about 90 percent of the time. Is it over-ambition, or too much self-criticism?

Eighth: I do enjoy Nature, and I have missed pictures rather than spoil a natural setting, be it ever so small or insignificant. Even though its life span is short and its beauty is fleeting, I prefer to leave a living thing, plant or animal, rather than move and destroy it for the sake of a picture.

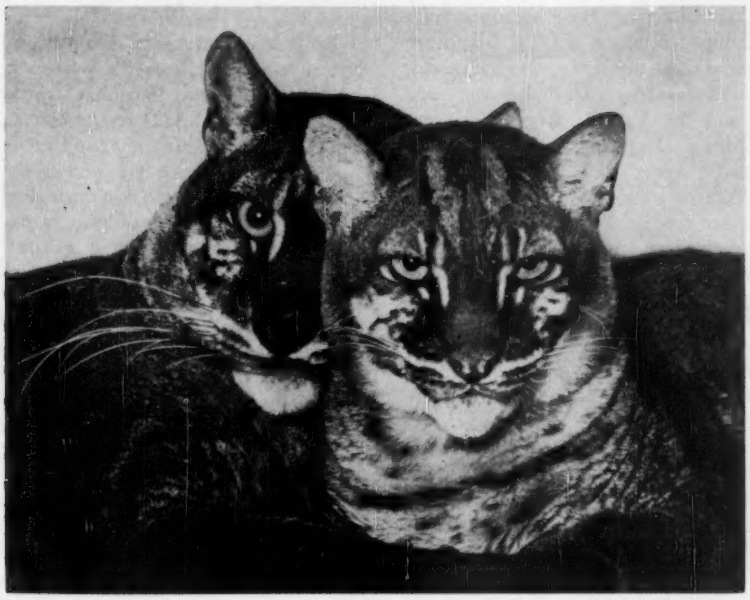
Ninth: I have remembered that likes differ, and that most people would rather see indifferent pictures of far-away places than good close-ups of things from the back yard.

I have noticed another interesting thing in watching non-photographers react to slides and photographs. Take away the glamor of "somebody's trip to Europe" and the scene must have some familiar tie-in to hold interest. The pictures must show well-known places or people. The camera eye, it seems, is better at jogging the memory than it is at opening the gates to new experiences for those who are not photography enthusiasts.

Tenth: I was "going to distinguish between my herd instinct and my abilities for solitary enjoyment" in connection with Camera Club membership and field trips. This resolution I cannot honestly label as either fulfilled or not fulfilled. The club field trips have inspired me with new ideas and ambitions but, actually, I have not taken part in a single one all year. I have suspected for a long time that I work better by myself; yet, seeing what other people have done on field trips, and trying to do similar things on my own, I feel that they have been beneficial. I would not drop my local Camera Club or PSA memberships for anything—the contact with others is far too stimulating for that.

Eleventh: More night shots—alas, no. Here is a resolution to be carried out, I hope, in 1958.

Twelfth: Have I kept my pictures simple and avoided "busy" back-



The feline tribe should not be neglected. This picture of "Golden Cats," taken by J. Musser Miller, APSA, of La Grange, Illinois, also won honorable mention status at the Chicago International Exhibition of Nature Photography.

grounds? To some extent, yes. There is still room for improvement here.

Thirteenth: Have I used slower film in the effort to get more detail? Perhaps not, but, on the other hand, my one attempt to use the new extremely high speed Ansco color film was not a success. I overexposed badly. Here is an area where more experimentation needs to be done.

Fourteenth: Have I edited and culled my pictures as they have accumulated? Here I can pat myself on the back and nod a happy yes. However, this self-satisfaction is the result of long hours last summer spent cataloging and filing the accumulation of seven years of color photography. What a session that was! But it is done—hurrah—and from here on you may be sure that I classify and record each box as it comes back from the processer. I also return slides to their proper places after I have "pulled" them for one reason or another. And they never lie around uncataloged or unfiled—what, never? W-e-e-e-l-l, hardly ever, anyhow.

Fifteenth: As for reading the works of the earlier photo-naturalists, here is another place where I can try to do better in the future. Also, I want to do more in the way of contemporary reading. PSA literature and other how-to-do-it-better materials are exceedingly helpful, if only one had time to read them carefully and then go right out and put the pointers into practice.

Improving those pictures

So much for a review of the gains and losses of the past year. The score was not too bad. But what new techniques and improvements should the future hold? In what way can pictures in 1958 be made better than those of 1957?

One: I think I should try to get better use from the auxiliary equipment I have accumulated. There is the pola-screen, for example. When I use it my skies go too black, although some photographers I know can obtain beautiful rich blue sky effects with the same equipment. Here is a case where a variety of shots of the same subject, with different times and exposures, and with *accurate records kept of each*, should help me determine the usage that will give best results with the equipment I have.

Filters, too, could be used more. I have not had mine out of their cases for many months. Nor have I used the lens shade as much as I should. Perhaps I can better my results simply by making use of my auxiliary equipment. After all, I do carry it around, so why not use it to advantage?

Two: I think I should try to pay more attention to special effects like shadows and reflections. There is a great field here for the photographer with imagination and an observing eye for artistic situations.

Three: Night time, as mentioned above, has many unexploited possibilities in both color and black-and-white. Here is another field for further investigation.

Four: Rainy days offer many photographic possibilities that I have done nothing about at all.

Five: While we are on the subject of weather, I want to take some snow pictures this winter—that is, if I can rustle my southern-bred bones up to the chilly snow country. That, believe it or not, requires a tremendous effort from one who is more familiar with palm trees than with icicles, and less afraid of prickly heat than of snow down the neck.

Six: For people who like flash work, there is a new area of interest in "available light" techniques. On the other hand, for people like me who prefer available light, or the more stable photofloods, perhaps flash will open a new field of interest. In either case, the field is worth trying.

Seven: Small wild mammals are highly elusive subjects. It is not too easy to find them, and harder still to take their pictures. Here is a good field for the photographer who wants to tackle the difficult.

Neglected kitties

On the domestic animal scene, I need to find some cat models. I have neglected the felines, although I have done fairly well by the dogs, horses, cows, and even pigs during the year just ended.

Eight: Locale series pictures and story-telling sequences make good camera quarry. A friend of mine is working on a series depicting "Beautiful Florida," to exchange with another photo-hobbyist who is doing the same for "Beautiful Ohio." Both are enjoying the experience.

Training School

Larry Andrews, executive secretary of the Arizona Humane Society, of Phoenix, Arizona, announces that the Society is embarking on a project never before undertaken by any other humane society. It is setting up a training program for young men and women who desire to dedicate their lives to animal protection work. "The need for trained humane workers is very great," says Mr. Andrews. "The biggest problem facing any humane society is the lack of trained personnel. We have determined to . . . help solve that problem."

Living Fossils

(*Continued from page 16*)

tackling bigger game. They have a penchant for pigs, and razorbacks roaming the scrub and wallowing in 'gator holes are likely prey.

In an alligator's mouth there are seventy to eighty conical teeth. Each is hollow at its base, and if it is broken off, there is another inside the hollow to take its place. Small prey, such as a fish or a small mammal, is crushed, wallowed, and swallowed whole. But if an alligator gets something too big to swallow in one piece, it jerks its head so swiftly and so violently that the hapless victim is actually torn to pieces.

The other part of the alligator of which to beware is its tail. One-third of the weight is carried in this massive, muscular appendage, and with one swing of the tail a large alligator can upset a boat, knock a man down, or break his leg. Ordinarily, of course, the tail is the alligator's principal means of swimming; the legs float idly.

Few animals can match the speed of an alligator under water. Otters, they say, can swim circles around an alligator—but apparently they get careless. Nearly any 'gator hunter will tell you about finding full grown otters in alligators' stomachs.

When an alligator snaps its jaws shut, it has a vise-like grip on anything between them. But once the creature's mouth is closed, it has unbelievably weak muscles for opening them. A man can hold those powerful jaws shut with one hand. Professional 'gator-wrestlers depend on this basic weakness for the success of their matches with the animals.

In addition to its elevated nostrils and popped eyes, the alligator has several other adaptations that fit it for an aquatic existence. It can close its ears when it dives, its nostrils have valves controlled by voluntary muscles so that the alligator can open or shut them at will, and there is also a valve than can close off the opening to its windpipe when it opens its mouth. This allows the alligator to grab prey under water without getting water in its lungs. Most astonishing, perhaps, are its third eyelids; transparent films, which, like a bird's, operate transversely rather than up and down. They slide over the 'gator's eyes when it swims under water.

To biologists, the strangest fact about alligators is that they are found in just two places in the world: in the southern United States, and along the Yangtze River Valley in China. The species in China is smaller, but it is nevertheless an alligator. And this remains an unsolved riddle: Why did these similar creatures survive in only two such widely separated places in the world?

The Heavens

(*Continued from page 45*)

moon will be full on January 5, and the New Moon will occur on January 19.

The earth will be at perihelion at 9 AM, EST, on January 3. This is the nearest approach of the earth to the sun on its yearly journey around the sun.

All planets will be in the morning sky, except Venus, which will be an evening star all month until January 28.

Mercury will rise low in the southeast, one hour and one-half before the sun. It will reach its greatest western elongation on January 16, on which date it will be most favorable for observation.

Venus will be very bright (magnitude −3.9). It will be best observable during the first half of January. Low in the southwest after sunset, it will set about 3 hours after the sun on January 1, 2 hours after the sun on January 15. On January 20, it will be found two-thirds of one degree north of the thin crescent of the moon.

Mars will rise in the southeast about 3 hours before the sun on January 15, and will still be low in the southeast by dawn. It will be found in Ophiuchus most of January, and will move into Sagittarius toward the end of that month.

Jupiter, in Virgo, will be about 10 degrees east of Spica. Rising in the east at about 1 AM, local time, it will be seen in the south at dawn. On January 13, it will pass 2 degrees north of the moon.

Saturn, in Ophiuchus, will rise in the southeast 2 hours before the sun on January 15, and will still be low in the southeast at dawn. On January 23, Saturn and Mars will appear only one and one-half degrees apart.

Observations of the Quadrantid meteor shower on January 2-3 will be hampered by bright moonlight and possibly by the fact that its sharp, but brief, maximum may occur during the daylight hours.

In the Market

For keeping track of the various Sputniks and satellites that will soon be zipping around, Farquhar Transparent Globes, of 3724 Irving Street, Philadelphia 4, Penna., has an Earth-Sky Globe on which you can easily calculate the times to look for any of them. Consisting of two transparent Plexiglas plastic globes mounted one within the other, a map of the earth is printed on the inner globe and a detailed star map on the outer; the price is $42.50, and you can get more information about the Earth-Sky Globe from the manufacturer.

For that camping trip with the station wagon next summer, Morsan Tents, 10-27 50th Avenue, Long Island City 1, N. Y., will custom-make a semi-fitted enclosure for the rear of the vehicle for $17.00, postpaid. All you have to do to get one of these all-netting, canvas reinforced additions is to furnish Morsan Tents with all rear dimensions of your wagon, and indicate your choice of the two styles available.

A complete self-contained do-it-yourself star finding device called the Star Pointer, that performs the mathematical calculations necessary to locate the constellations and first-magnitude stars at any given time of day, any day of the year, has been announced by Starcraft, 2917 Edghill Road, Cleveland 18, Ohio. The complete kit sells for $4.95, and comes with a fully illustrated 20-page instruction book. After you have located a heavenly object, the Edmund Scientific Company of Barrington, New Jersey, has a nice 200-power refractor-type astronomical telescope with which to view it. This telescope has a 42mm achromatic objective lens, 38-inch tube length, and a newly designed attachment clamp for solid, vibrationless viewing; it sells for $19.95 postpaid, complete with 273-page "Handbook of the Heavens," Star Chart, and 16-page star booklet.

Bulletin

"The Awakening North" is a large-format, colorfully illustrated brochure, an excerpt from the 1956 annual report of Seagrams, Limited, telling the story of what is happening today in one of the world's last frontiers and barely-touched treasure-houses, the vast Canadian northland. From Seagrams, Ltd., 1430 Peel Street, Montreal 2, Canada.

Personalities

Dr. Albert E. Parr, director of the American Museum of Natural History in New York City, has announced the appointment of Walter F. Meister as deputy director of the Museum, and the appointments of Drs. Robert Carneiro and Wesley Lanyon as assistant curators. Dr. Carneiro, who becomes Assistant Curator of South American Ethnology, is a former instructor in anthropology at the University of Wisconsin, while Dr. Lanyon, the new Assistant Curator of Birds, is a former instructor at Miami University in Ohio . . . The National Park Service announces the retirement of Louis Schellbach, III, chief naturalist at Grand Canyon National Park, who for more than sixteen years has been director of the interpretive program there. During his years at Grand Canyon, Mr. Schellbach made many notable contributions to scientific knowledge of the plants, animals and geology of the Grand Canyon region . . . Henry Clepper, executive secretary of the Society of American Foresters and managing editor of the *Journal of Forestry*, was awarded the Gifford Pinchot Medal for outstanding service to forestry at the annual meeting of the Society in Syracuse, New York, November 13, 1957.

Commemorative Stamp

One of the ten commemorative postage stamps approved for issue this year by the Post Office Department will do honor to the Garden and Horticultural Clubs of America, and is scheduled for release on March 15, centenary of the birth of Liberty Hyde Bailey, American botanist and horticulturist. L. H. Bailey, whose name is so familiar to systematic botanist and amateur gardener alike, was born in the town of South Haven, Michigan, March 15, 1858.

Electrons and Hippos

The connection between the hippopotamus and hydro-electric power might seem to some, as Sherlock Holmes was fond of saying, rather remote at first glance. But the government of Nyasaland recently found that there was such a connection, according to the October, 1957, bulletin of the International Union for Conservation of Nature, of Brussels, Belgium. After installing a hydro-electric plant on the upper Shire River in Nyasaland the government found it imperative to arrange for the protection of the hippopotamuses of the district, so that the big animals would feed on the dense vegetable life that threatened to block the river after the dam had reduced the force of the current in the channel. It appeared to be a case of no hippos, no lights; and the hippos won.

Color Chart

The American Horticultural Council, after years of search for a popularly priced color chart, is now making available to the horticultural public the Nickerson Color Fan. Developed by Miss Dorothy Nickerson, color technologist in the U. S. Department of Agriculture, with the cooperation of the Munsell Color Foundation, the chart will undoubtedly take its place as a color standard in all phases of horticulture. Easily fitting any pocket or handbag, the chart contains 262 colors of 40 hues, and is complete with a booklet explaining its use. Its color names have been selected as standard by the Inter-Society Color Council and the National Bureau of Standards. For information and price, write Donald Wyman, Secretary, American Horticultural Council, Arnold Arboretum, Jamaica Plain 30, Massachusetts.

Heavenly Lift

Workers at the Stanford Research Institute in Menlo Park, California, are taking experimental advantage of the debris-trails left by meteors in the earth's upper atmosphere to extend the range of very-high-frequency radio communication. VHF radio waves are ordinarily limited in range by the curvature of the earth's surface; but SRI engineers have been bouncing such waves from meteor trails to points as far as 1400 miles from the transmitter, using the trails as "backboards." The engineers point out that speed is of the essence in transmission via meteor trail, as the life of a trail ranges from a fraction of a second to only a few minutes.

Jungle Magic

In the jungles of Panama there is a bird that seems to be an accomplished ventriloquist, reports Dr. Alexander Wetmore of the Smithsonian Institution in Washington, D. C. This bird, the gray-headed dove, is common in the forests of Isla Coiba, one of Panama's Pacific convict islands, notes Dr. Wetmore in a recent publication. "They live and feed on the ground" says Dr. Wetmore. "Some of the males were calling, a single hooting note, so highly ventriloquial that we never succeeded in following it to see the actor perform, though we were certain of the source . . . Always the impression was that the sound came from the trees rather than from the undergrowth near at hand."

Fish Traps

People who are interested in keeping America's highways as litter-free as possible may feel, in their more discouraged moments, that a goodly percentage of the 42 billion or so tin cans opened by the American public last year landed beside the nation's roadways. Apparently this is not wholly true. There were enough left over to provide a hazard to young fish in trout streams, according to the report in the Portland, Oregon, *Fishing and Hunting News*. It seems that empty cans with V-shaped openings can be death traps for fingerlings when chucked into streams, and an Oregon fisherman recently discovered one such can with 40 young steelhead imprisoned within, of which more than half were dead, apparently from oxygen starvation.

The Fishes of Ohio

By Milton B. Trautman. Columbus, Ohio. 1957. Ohio State University Press. 683 pages. With illustrated keys. $6.50.

A critical study of the 172 different kinds of fish to be found in the waters of Ohio, by a scientist who is also an ardent fisherman as well as a leading authority on the identification and life history of fishes. In this large book the reader will find a blending of the interests of both scientist and fisherman, along with a great storehouse of facts about the fishes of Ohio and its neighbors.

A General Textbook of Entomology

By A. D. Imms. Revised by O. W. Richards and R. G. Davies. London. 1957. E. P. Dutton & Co., New York. 886 pages. Illustrated.

This is the ninth edition of the basic textbook on entomology that first appeared in 1925, and incorporates recent literature on the subject up to the year 1952.

Jens Jensen

(*Continued from page 23*)

Lake Michigan shore where, in the Ridges Sanctuary, old dunes reveal hundreds of dwarf iris, ram's head lady's slippers, arbutus, marsh marigolds and pitcher plants, and the lovely *squishiness* of a tamarack swamp and spruce bog. There are mats of bearberries in bloom, and the little pink butterflies of gay wings. A little later, in June, orchids are found here in profusion.

It is, as a habitat, totally different from that of "The Clearing," yet is integrated with it as part of a field study featuring not only plants and animals of "The Clearing," but the meanings of ecological environments and successions, the relationship of plants and animals to each other in different types of haunts. The Ridges Sanctuary, incidentally, was saved as a sanctuary partly through Jens Jensen's efforts—but that is another story.

By the end of a week, adults in the Nature course have become deeply attached to and interested in a world they may have been little aware of before. This may be because the course does not confine itself simply to identifying the wild things; it is, instead, related to fostering a growing kinship between them and people. The week becomes a series of personal discoveries, as each person finds his affinity with trees and other wild creatures.

This atmosphere is continued throughout the year by Mertha Fulkerson who, as a disciple of Jens Jensen, has spent twenty years at "The Clearing." As resident director, it is she who has continued the teachings of Jensen, subtly, not obtrusively, yet making everyone aware of the singular poignance of wind-swept arbor vitaes, the return of the beeches, and the ideals of a man who loved and understood them.

It is her firm belief, also, that people who have been deriving inspiration and knowledge all week at "The Clearing" should give part of themselves back to it, to make the relationship permanent. Artists, therefore, leave paintings. Writers leave books. Others contribute their time and energy.

The Nature group, therefore, went out to a section of woods where trees had once been felled in order to put a road to the parking place. The trees themselves had been cut up for firewood, but the brush remained as a fire hazard. With a resounding racket, then, and with the delight of a lot of small boys turned loose with ax and saw, men and women went into the woods to break down the standing brush, and reduce it to such an extent that it would more readily decay into the earth. With appetites that exceeded any they had displayed all week—and these had been hefty enough under that genuine appetizer of morning and afternoon walking—the lumber crew attacked dinner that day with vigor and with the satisfaction of having given part of themselves to the welfare of "The Clearing."

It is this unity of humans and trees that brings people back, again and again, to savor the good atmosphere of Jens Jensen's favorite forest, "The Clearing." ❦ ❦ ❦

Ancient Paths

The prehistoric migrations of big game mammals between the Old and New worlds are illustrated dramatically in an animated, carved lucite relief map recently unveiled in the Hall of North American Mammals of the American Museum of Natural History in New York City. Believed to be the largest one-piece lucite map ever made, it is five feet high and eight and a half feet wide, with a complex system of wiring whereby the animal figures and migration paths are illuminated. The self-illuminated map shows how the land bridge that spanned the Bering Strait ten to twenty thousand years ago accounts for the presence in the western hemisphere of large mammals whose ancestors evolved in Europe and Asia. The map also illustrates the westward migrations, by the same route, of species that originated in America and are found today in the eastern hemisphere.

Smokey's New Job

Smokey, the forest fire prevention bear, is hitting the lecture circuit with a story on forest products, now that technicians at the U. S. Forest Products Laboratory have finished grooming him for the new task. Originally adopted by the State foresters and the Forest Service as a national symbol of forest fire prevention, Smokey's work now includes a "spiel" on the importance of better wood utilization as a means of conserving the Nation's timber supplies.

Bulletins

"McGraw-Hill Text-Films on Biology and Nature Study" is a four-page brochure listing films and filmstrips on Nature study, natural resources, zoology and biology that are available for rental from film rental sources or by direct purchase from the McGraw-Hill Text-Film Department. The price and time of each film or filmstrip are listed at the end of each description, and further information may be obtained from the Text-Film Department, McGraw-Hill Book Co., 330 West 42 Street, New York 36, N. Y. (In Canada, 253 Spadina Road, Toronto 4, Ontario.)

"Forest Service Films," for sale by the Superintendent of Documents, Washington 25, D. C., for fifteen cents, contains twenty pages of information about the 16 and 35mm sound-on-film type films available from the U. S. Forest Service for educational purposes. The pamphlet tells how to apply for the films, and gives a list of the regional film libraries of the Forest Service where the listed titles may be obtained.

"Trout of California," by J. H. Wales, fisheries biologist of the California Department of Fish and Game, is a 56-page booklet telling the story of the trout of that State—habits, life history and distribution—and how they may be distinguished. With some fine trout reproductions in both black and white and full color, two pages of trout-food insects by Dr. E. Laurence Palmer, and a good bibliography, it is available from the California Department of Fish and Game, Sacramento, California, at thirty cents.

"Pruning Trees, Shrubs, Roses" is Circular 779 of the University of Illinois Extension Service, by H. R. Kemmerer, extension specialist in landscape gardening. The do's and don'ts of pruning, from large trees to small shrubs, with line illustrations. From the College of Agriculture, University of Illinois, Urbana, Illinois.

"Fur Seals of the Pribilof Islands," by Ralph C. Baker, assistant chief of the Fish and Wildlife Service's Branch of Alaska Fisheries, is the profusely illustrated story of the Alaska seal herd—how it was nearly annihilated by early slaughter, its rejuvenation, and its present management by the Fish and Wildlife Service. From the Superintendent of Documents, Washington 25, D. C., twenty cents.

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BOOKS ON BIRDS, Mammals, Reptiles, Trees, general nature subjects. Catalog sent on request. Pierce's, Winthrop, Iowa.

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NATIONAL GEOGRAPHIC MAGAZINES 1888, 1954. Any issue. Periodical Service, Box 465-N Wilmington, Delaware.

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Nature AND THE MICROSCOPE

By JULIAN D. CORRINGTON

Family Album

9. Prism Binoculars

AN OPTICAL instrument designed for the outdoors rather than the laboratory is the binocular, and when this term is used alone, it is understood to refer to a pair of erecting telescopes joined together and incorporating prisms in the light path of each. *Prism binocular* is more definite, since the ordinary field glass or opera glass are also binoculars in the sense that the lens system is double and both eyes are used, but these devices are not equipped with prisms. If you were in the laboratory and talking about binoculars, you would be referring to binocular microscopes, so the isolated word "binocular" leaves much to be desired as a title, being quite on the side of ambiguity.

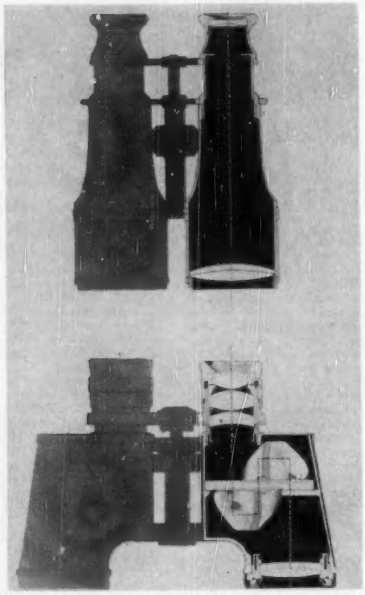
The prism binocular is the class among the three kinds of magnifiers for distance vision, at least for ordinary mortals who do not harbor a 200-inch telescope in their back yard. Astronomical telescopes are of two general types, reflecting and refracting, using respectively mirrors or lenses for their light-gathering objectives, and both of these yield images that are reversed and inverted. Accordingly the more elaborate kinds of terrestrial telescopes must be equipped with prisms or lenses to erect the image and reverse it a second time, so that it appears in correct spatial relationships. It so happens that the design of one of the simplest styles provides an erect image without additional elements; this is the Galilean telescope or spyglass, with a convex objective and concave eyepiece. It is focused by sliding its sections one within another, an arrangement that has extended the application of the word "telescope" to other appliances, such as a valise or a drinking cup, and has even given us a verb, irrational as that may seem; as when, in a train wreck, one car is telescoped by another.

Field glass

The field glass or opera glass consists of two Galilean telescopes, side by side, with a central focusing screw. Vision is direct, through each tube, and for low magnifications, 2X to 5X, is satisfactory for such general purposes as the race track or stage or elementary bird study. When the power is increased, however, the diameter of the field of view falls off rapidly, so that in instruments of 6X and above, the effect is about that of looking through a length of pipe. The better glasses in this class have a central hinge-and-axle, which permits adjusting the distance between the centers of the two eye-pieces so as to accommodate for variation in interpupillary distance in different persons. This is quite essential if both eyes are to be used; without this adjustment, one might better purchase a spyglass.

The construction of a binocular is such as to increase the length of the optical path without a corresponding increase in tube length. In this way the body of the instrument is kept to a conveniently small size, yet with the advantages of long tube length. A second gain comes through the fact that when the binocular is focused on an object, the two objectives are farther apart than are the two eyes of the observer, yet both are trained on a single object. This heightens the stereoscopic effect and gives greater depth to the image. But the big improvement inherent in the design is that the prisms do the inverting and reversing of the image, and hence the eyepieces do not have to be the simple concave element of the Galilean telescope, but can be of wide diameter and of numerous elements, permitting higher magnification along with wider field of view, brighter illumination, and the correction of aberrations.

Of the seven lens defects listed in our article in this Department for the preceding issue (December), three



1. Sectional views of field glass and binocular, showing comparative sizes and light paths.

are of frequent occurrence in substandard binoculars—distortion, curvature of field, and chromatic aberration. The eyepieces in the better-made modern examples commonly use five or even six elements, whereas the objective has only two. Thus, the situation is the reverse of that in compound microscopes, where the objective is by far the more complex and costly of the two optical parts, and requires the computation of corrections for defects.

The Porro prism

The heart of the binocular design is the use of two Porro prisms, a type named for the inventor, I. Porro, an Italian engineer. As may be noted in an accompanying illustration that shows a sectional view of one half of a binocular, such a prism reverses the direction of light rays, bending them 90° at each of two surfaces by means of total internal reflection. By arranging the two prisms at right angles to each other, one of them changes the rays right for left and the other top for bottom, thus reversing and inverting them to erect the image. We have discussed prisms in the issue of February, 1955, and total internal reflection in April, 1955.

Every glass-to-air surface in an optical system, whether of mirror, prism, or lens, brings about loss of a certain percentage of incident light because of reflection and absorption. Four to six percent of all entering light rays thus are lost, depending

on the refractive index of the glass. Of no great matter in a simple Galilean type field glass, with no more than four such surfaces, this problem becomes a serious one in a binocular, with its much larger number of surfaces—as many as twelve in each tube of a modern instrument. Up to fifty percent of the incident light may be lost in this manner, significantly dimming the image. But of even greater importance is the reflecting back and forth within the optical system of the strayed light rays, producing effects termed flare, scatter light, or ghost images, and resulting in a fogged, or hazy, as well as a dimmed image.

Small wonder, then, that optical manufacturers hailed the invention of anti-reflection coatings as the greatest contribution in the field of optics in our century. Instruments so equipped are said to have *coated optics*, and those properly and scientifically done must be hard coatings that will not wipe or wash off. A molecular deposit of a very thin film of a metallic salt is placed on each glass surface, the film being only about four-millionths of an inch in thickness. Different companies have their special trade names for their processes, as Balcote for Bausch & Lomb's, Americote for that used by the American Optical Company. If all the surfaces in a binocular are coated, light transmission is increased some fifty percent, and the degrading of contrast in the image due to flare is eliminated.

Binocular designations

Designations seen on binoculars are such as "7X35", or "8X30." The first of these figures gives the magnification (7X, 8X) while the second gives the diameter in millimeters of the objective lenses. These two factors determine the *relative brightness* of the instrument, a numerical rating of the area of the exit pupil of telescopic instruments, indicating the size of the bundle of light rays transmitted by the eyepiece. To see the diameter of the exit pupil of a binocular, hold the glass at arm's length, pointed at the sky, and note the bright disc of light in each eyepiece. It is not at all the same thing as the diameter of the eyelens, but is much smaller. The diameter of the disc shows how much image-forming light is coming through the binocular. Relative brightness is a function of the magnifying power and the size of the objective lens. It is the square of the quotient of objective aperture and power. Thus, for a 7X35 binocular, the exit pupil is 35 divided by 7, or 5mm, and the relative brightness is this figure squared, or 25. In comparing binoculars, however, it must be observed that the light beam from the eyelens must enter the eye to be of any use, and that the size of the bundle that can do so is controlled by the entrance pupil of the eye. This is regulated by the iris muscle, which responds automatically and involuntarily to the intensity of the light, closing down to 2.5mm in very bright light, expanding to about 3.5mm on a dark day, 5mm at twilight and 7mm or more in complete darkness. A wide band of light from a binocular cannot enter a contracted eye pupil; any rays in excess of the eye pupil's diameter are wasted. Any binocular with an exit pupil greater than 3.5mm (relative brightness 12.25) provides all the light that can be used by the eye in the daytime. A 5mm exit pupil (r.b. 25) can enter the eye at dawn or dusk, and when the iris of the eye is opened at night to give an entrance pupil as great as 7mm, the eye can accept the high r.b. of approximately 50.

This means that a 7X35 binocular with r.b. 25 will give fully as bright an image to the eye in daylight as the much larger and heavier 7X50 with r.b. 50.4. But comes the night and the larger instrument has all the advantage, transmitting a much brighter image, and hence it is often designated a night glass.

Selecting a binocular

Selection of a binocular should be based on the chief use for which it is intended. It is impossible to make a binocular that combines the highest magnification with the widest field of view and highest relative brightness, not to mention such other desirable attributes as small size, light weight, and low price! Some of these are incompatibles. Magnifications run from 6X to 9X. Owing to the difficulty of holding the higher-powered glasses steady with the hands alone, if 10X or higher is wanted, a telescope or spotting scope mounted on a tripod is indicated. Diameters of objectives vary from 30 to 50mm. Football fans want primarily a wide field of view, and should buy the 6X30, sacrificing power for field. A power of 6 is sufficient for this spectator usage, but should the viewer insist, he can buy a special widefield binocular and get both power and field, if he is willing to pay a considerably higher price. The widefield 9X35 can be made to provide as wide a field as the standard 7X35.

The navigator will want to use his glass by night as well as by day, and chooses the 7X50. The explorer in the mountains and student of big game demands power above all, and sacrifices width of field to get it, buying the 9X35. For general purposes, including bird study, the racetrack and travel, the ideal glass is the 7X35. With the new frames of magnesium alloy, such a glass is light in weight and compact in size, and can be supported by the hands without appreciable vibration. This glass gives a degree of magnification

2. The proper way to steady a binocular—thumbs on cheek bones, index fingers on forehead. Prevents contact with eyeglasses.

that most people can use without difficulty, a reasonably wide field of view, and a brilliant image. The average user prefers center focusing, done by turning a wheel at the central hinge, both tubes moving in or out together. The armed services, on the other hand, specify individual focusing models, each eyepiece separately adjustable, since this style provides greater protection against penetration of moisture to the interior. Center focusing instruments allow for rotation of the right eyepiece so that it may be set at a slightly different focus from the left eyepiece, thus accommodating eyes of unequal vision.

Accessories provided by manu-

facturers and dealers include flat eyecaps for those who wear glasses, rubber eyeguards to fit around the eyes and eliminate the distraction of light coming in from the sides, tripod or monopod adapter mount, chrome initial letters for indicating your personal possession, plastic field-storage bag, neck-strap pad, adjustable neck-strap, a shirt anchor to do away with swing and sway, and a rain and dust guard that will slip down the neck-strap and cover the eyepieces as need may arise.

Microcommercials

The Edmund Scientific Company, Barrington, N. J., announces new non-woven rayon wiping and polishing cloths that have been silicone treated to impart a protective, odorless, non-oily, non-greasy coating to highly finished glass, plastic, and metals. Protection is furnished against fingerprints and the etching action of skin acids, dust, lint, mildly corrosive atmospheres and other deteriorating wastes such as grits and moisture.

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Schaar and Company, purveyors of all sorts of laboratory supplies and equipment, have moved to a handsome new building at 7300 West Montrose Ave., Chicago 34. Here they anticipate improved facilities for handling their rapidly expanding business.

John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, are celebrated publishers of books in all fields of science, and have recently done a little celebrating of their own organization. *The First One Hundred and Fifty Years: A History of John Wiley & Sons, Inc.* is of interest to bibliophiles and to the trade and to those especially who delve into the early scene in Gotham. A good condensation appears in *The Wiley Bulletin*, Vol. XXXX, No. 1, Spring, 1957, and makes interesting reading for anyone who likes success stories.

Speaking of house organs, there is *Opticus*, subtitled *Betriebszeitung der Firma Wild Heerbrugg A G.*, which tells all about the people who make the famous new Wild microscopes and other optical items. It is beautifully printed and illustrated, with scenes in and about the factory, in Switzerland, with such personal items as marriages and births, thumbnail sketches of honored employees, athletics, and picnics. But you must be able to read German to cope with it.

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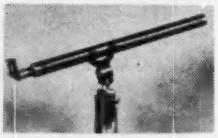

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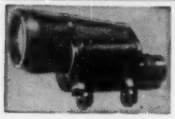

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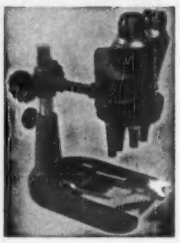

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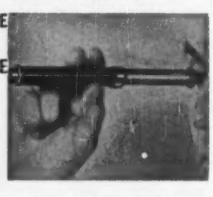

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